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factory

Management and Maintenance

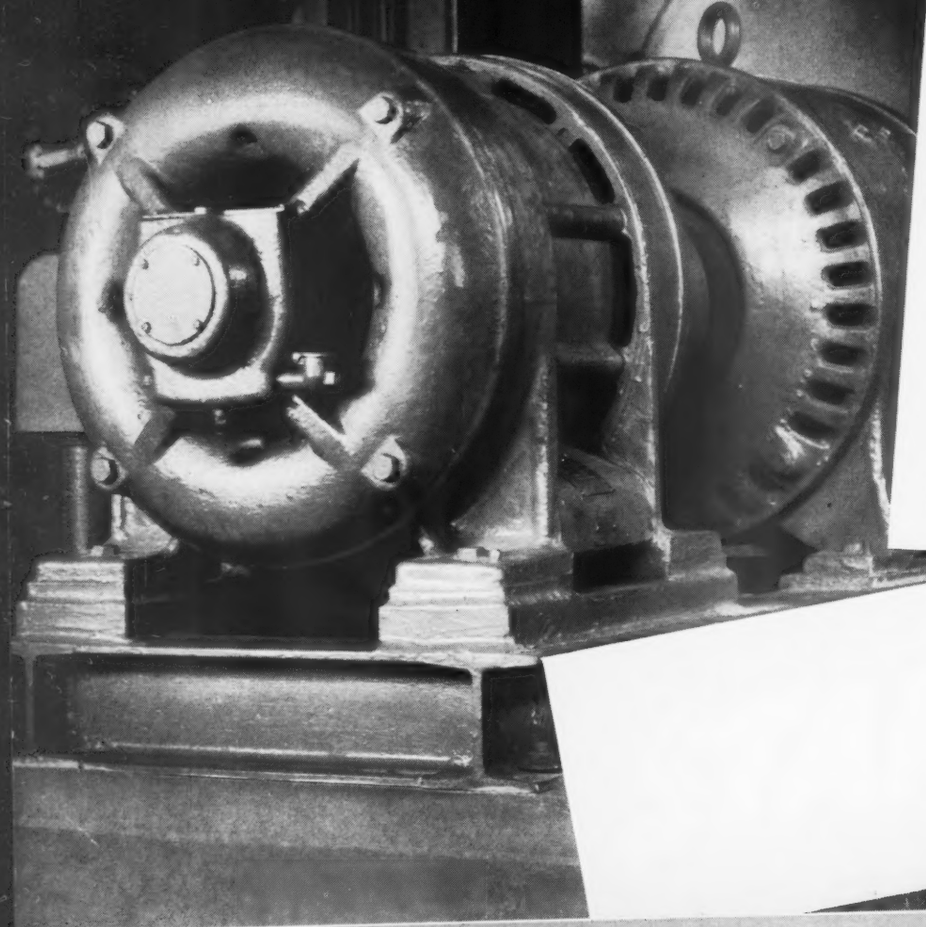
500 QUICK WAYS TO PROFITS

141.488

McGRAW-HILL PUBLISHING COMPANY, INC.

REPLACES 2 OILS AND SAVES BEARINGS

ON SHOVEL MOTOR-GENERATOR SET...



ORDINARILY, shovel operation in stripping required two oils, one for summer and one for winter lubrication of motors and motor generator bearings. A central state operator was having trouble during the spring and fall seasons, when temperatures varied widely, in determining just when to change oil. Each change of season brought a disheartening number of bearing failures.

The Standard Lubrication Engineer told him about Stanoil No. 25, an oil with low pour test that maintains its lubricating quality over a wide range of temperatures.

With Stanoil No. 25 in the bearings the year around, the chief electrician found that he could quit trying to outguess the weather man. Bearing failures stopped, and, in addition, he had one oil less to stock. The slightly higher cost of the oil was more than paid for by saving in bearings and repair costs.

It's almost certain that somewhere in your operation the higher quality in Stanoil will pay its way in reduced maintenance and lower ultimate oil costs. Let a Standard Lubrication Engineer point out some of these places. He'll make this analysis at no cost to you. Call him at the nearest Standard Oil (Indiana) office or write 910 South Michigan Avenue, Chicago, Illinois.

Copr. 1938, Standard Oil Co.

STANDARD OIL COMPANY (INDIANA)

LUBRICATION ENGINEERING THE RIGHT LUBRICANT • PROPERLY APPLIED TO REDUCE COSTS

Another Goodrich "Belt" that Flexes Longer

A typical example of Goodrich development in rubber

IF GOODRICH means only transmission belting and hose to you, let this young lady remind you that Goodrich makes everything of rubber from thread to steel mill rolls, from paint to acid tanks, from street car springs to putty. There isn't a home or office, factory or farm, that couldn't be made more efficient and economical with Goodrich rubber.

The same engineers who developed a transmission belt which flexes five times longer have now developed a new rubber yarn for girdles which lasts longer, helps female America "keep in shape"... Latex is made into a special age-resisting, heat-resisting compound, drawn into strands fine as a hair, and cured. Two strands of cotton thread are then wound around the rubber under tension. Result is a yarn so fine it takes *3 miles* to make a pound, yet so strong it keeps its flexibility, good as new, long after other rubber yarns are as lifeless as an old garter.

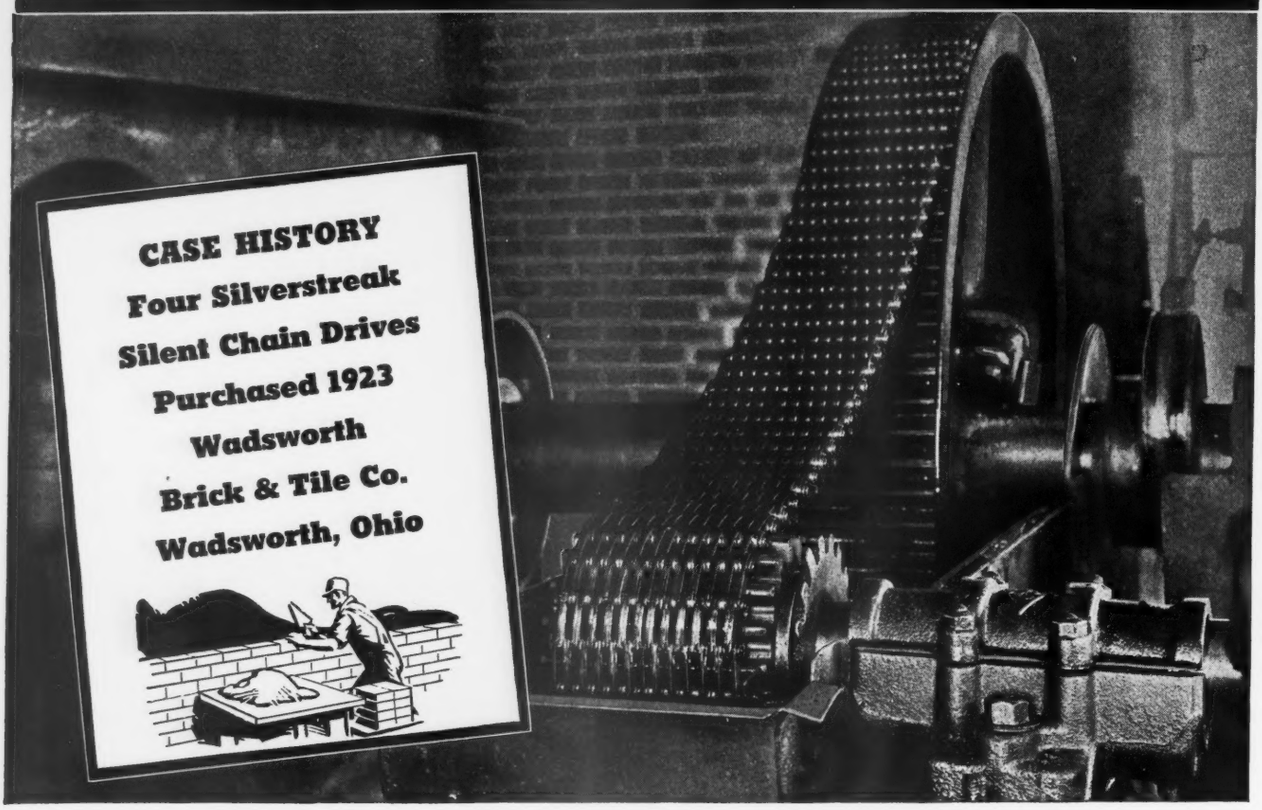
Ideal for the more active, athletic women of today (whose activity wore out former rubber yarns), this latest Goodrich development is a typical example of the versatility of Goodrich engineers. Scarcely a week passes that they do not find a new improvement —to make rubber or synthetics last longer, resist air or chemicals better, stand more impact and abrasion... All these improvements are applied at once to all Goodrich products they can benefit, so don't take it for granted that the belting, hose, tanks, packing you use are giving you the longest possible life—until you find out what improvements Goodrich has made in comparable products. Your Goodrich Distributor can tell you, or write The B. F. Goodrich Company, Mechanical Rubber Goods Division, Akron, Ohio.

Goodrich

ALL *products problems* IN RUBBER

Another story of Goodrich development work appears on the page facing the third cover

SILENT CHAIN PERFORMANCE FACTS



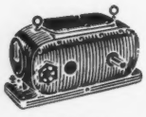
Trouble-free Operation 24 hrs. a day for 15 years .... with No Repair Expense

● Think of it! The equivalent of 58 years of service on a 40-hour week basis and still performing perfectly. And besides, during all these years, there have been no repairs—no maintenance expense or attention required except for periodic lubrication. That's the kind of performance that's made the Link-Belt Silent Chain Drive the "Champion" of all drives. Positive delivery of every R.P.M. — practically no attention or upkeep and outstanding economy are advantages this drive offers you. For complete information, send for our Engineering Data Book No. 125. Also for special books covering all or any of the complete line of Link-Belt positive drives illustrated below.

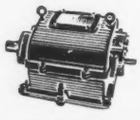
Link-Belt Company, Indianapolis, Chicago, Philadelphia, Atlanta, San Francisco, Toronto. Branch offices and distributors in principal cities.

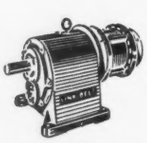
7490

ROLLER CHAIN DRIVE


P.I.V. GEAR SPEED VARIATOR

V.R.D. VARIABLE ROLLER DRIVE

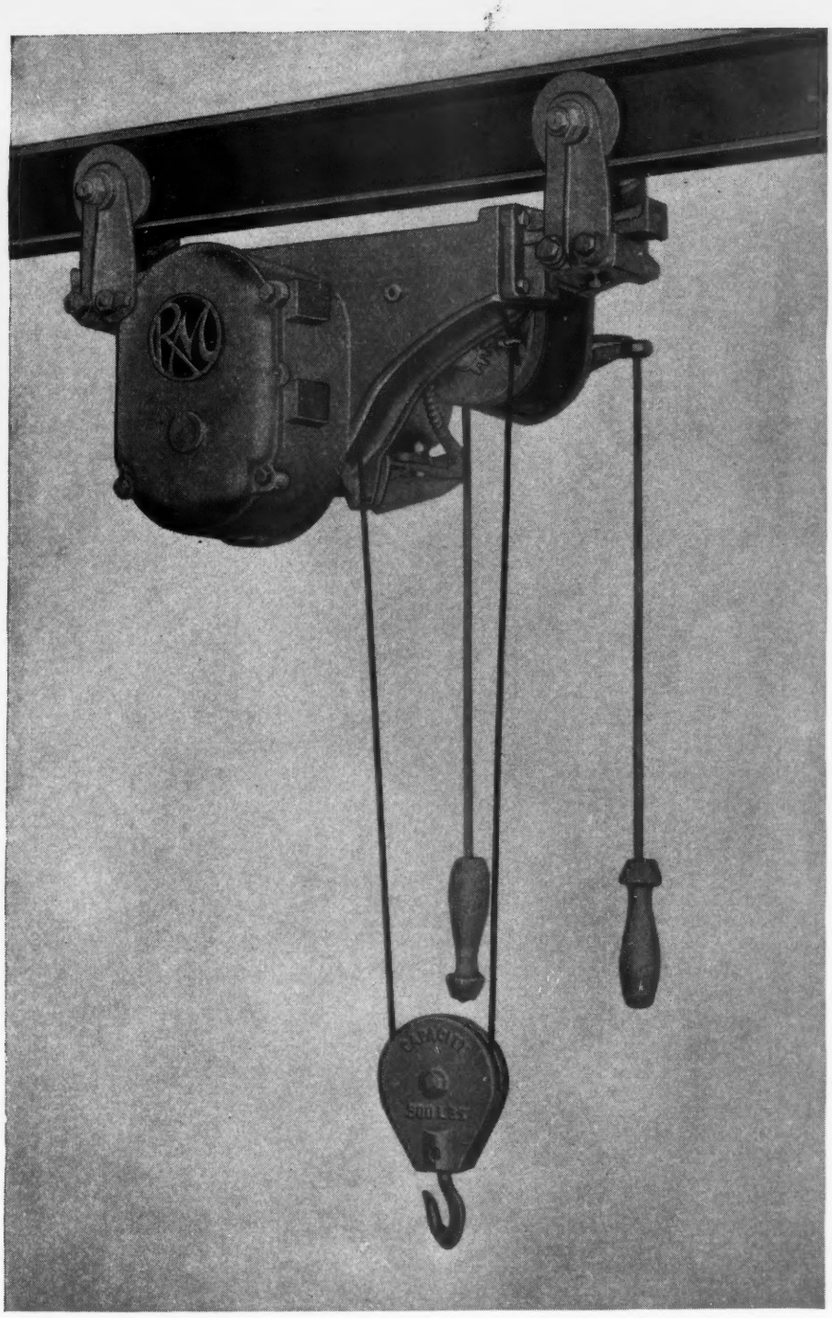

HERRINGBONE GEAR REDUCER


MOTORIZED REDUCER

WORM GEAR REDUCER

LINK-BELT

SILVERSTREAK SILENT CHAIN DRIVES



SCARCELY AWARE OF THEIR PRESENCE SO EFFICIENTly DO HYATTS SERVE

ROBBINS & MYERS, INC., Hoist & Crane Division, build this Hyatt equipped hoist. Another material handling unit freed from bearing wear and care.

The manufacturers who each year build millions of Hyatt Roller Bearings into their equipment for quieter, smoother operation are, of course, aware of the incalculable performance values contributed by Hyatts. But equally priceless, to the users of this equipment, is the care-free long life these better bearings afford, even though the buyer scarcely realizes their presence, so silently and efficiently do Hyatt Roller Bearings always serve. No wonder Hyatts are in such demand. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey, and San Francisco. Hyatt Roller Bearing Sales Company, Chicago and Pittsburgh.

HYATT
ROLLER
BEARINGS

FACTORY MANAGEMENT and MAINTENANCE (a consolidation of Factory and Industrial Management (including "Factory") and Maintenance Engineering), Nov., 1938, Vol. 96; No. 11. Published monthly. McGraw-Hill Publishing Company, Inc. Publication office, 99-129 North Broadway, Albany, N. Y. Editorial and executive offices, 330 West 42d Street, New York, N. Y. Entered as second class matter, November, 1936, at Post Office, Albany, N. Y., under the Act of March 3, 1879. Price 35c a copy. Subscription rates—United States, Canada, Mexico, and Central and South American countries, $3 a year. All other countries, $4 a year or 16 shillings.

Think of Dodge . . . *when planning a new plant . . . when adding a new department . . . when installing new machinery . . . when modernizing old equipment . . . when designing new products.*

POINTED for Profit

● EXECUTIVES "pointing for profit" should include, during the early stages of planning, careful consideration of the equipment which controls the movement of power from source to point of utilization . . . At these times . . think of Dodge Drives . . specify them in your original plans . . for it is a proved fact that production profits are in the making between power generation and its travel to production machines . . . Dodge makes a complete line . . drives of proven performance and economy, but even more, Dodge represents a vast fund of practical experience gained over a period of nearly sixty years of service to industry which is reflected in its recommendations. There is a *right drive for every job* and the Dodge organization is ever ready to work with you to that end.

DODGE MANUFACTURING CORPORATION
MISHAWAKA, INDIANA, U. S. A.

The book "Pointing for Profit" just issued will suggest many profitable applications of Dodge drives.

DODGE
MISHAWAKA

There Is Added Value in the Name Dodge!

THE Right Drive FOR EVERY JOB

Think of Dodge

When planning a new plant — call on Dodge for unprejudiced power transmission recommendations backed by nearly sixty years experience.

When adding a new department — call on Dodge to recommend "the Right Drive for Every Job."

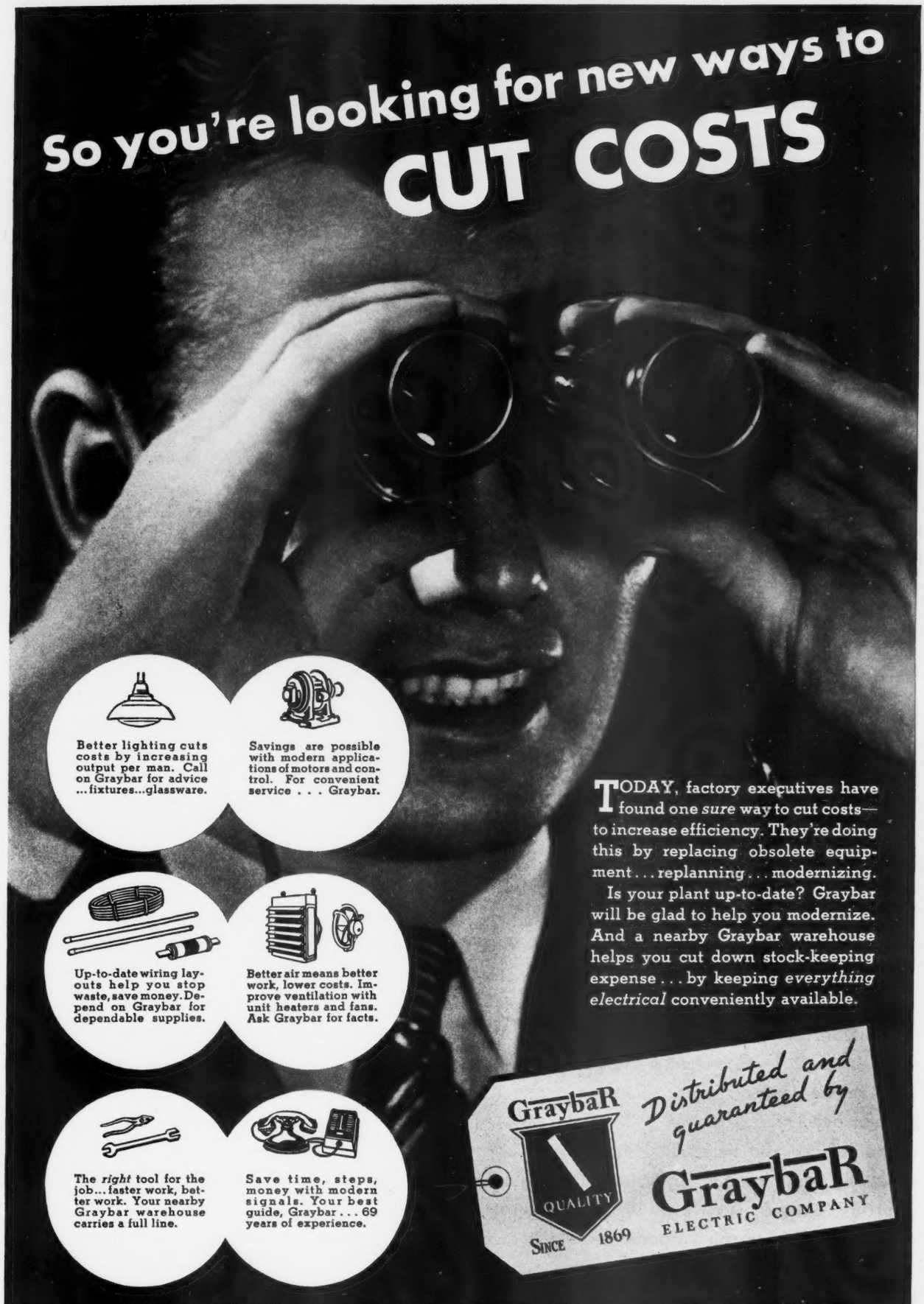
When buying new equipment — specify Dodge power drive and bearing units.

When modernizing old equipment — install standardized Dodge power drive and bearing units to save time, money and power.

When designing new products — use standardized Dodge power drive and bearing units to cut costs and improve performance.

...ized Dodge power drive and bearing units to cut costs and improve performance.

EVERY JOB


So you're looking for new ways to
CUT COSTS
Better lighting cuts costs by increasing output per man. Call on Graybar for advice ...fixtures...glassware.
Savings are possible with modern applications of motors and control. For convenient service . . . Graybar.
Up-to-date wiring layouts help you stop waste, save money. Depend on Graybar for dependable supplies.
Better air means better work, lower costs. Improve ventilation with unit heaters and fans. Ask Graybar for facts.
The right tool for the job... faster work, better work. Your nearby Graybar warehouse carries a full line.
Save time, steps, money with modern signals. Your best guide, Graybar . . . 69 years of experience.
TODAY, factory executives have found one sure way to cut costs—to increase efficiency. They're doing this by replacing obsolete equipment . . . replanning . . . modernizing.
Is your plant up-to-date? Graybar will be glad to help you modernize. And a nearby Graybar warehouse helps you cut down stock-keeping expense . . . by keeping everything electrical conveniently available.
GraybaR
QUALITY
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OFFICES IN 83 PRINCIPAL CITIES . . . EXECUTIVE OFFICES, GRAYBAR BUILDING, NEW YORK, N. Y.

MASSACHUSETTS in 1773
REBELLED against UNFAIR TAXES

MASSACHUSETTS remains FAIR in her own TAX LEVIES ON INDUSTRY

People in Massachusetts esteem industry and craftsmanship — industry by which Massachusetts has grown mighty — skill, which through the years, has become a revered heritage. In such an atmosphere industrial intolerance does not flourish. Such men do not burden industry with insufferable taxation.

Thus, in solvent Massachusetts, manufacturing corporations enjoy the lowest taxes in the United States. The state tax has not been increased since 1920 and the only local tax paid by manufacturing corporations is the tax on real estate. There are no onerous "extras", such as municipal property taxes or high levies on corporations which carry on only a part of their business within the state — no complicated taxes divided between "tangibles and intangibles".

Massachusetts welcomes new industries and offers these unparalleled advantages: — minimum taxation; the best source of skilled, steady labor; proximity to many of America's major markets; excellent transportation; sound banking; invigorating climate; and unsurpassed living and cultural facilities.

A brief book of accredited facts, *The Industrial Advantages of Massachusetts,* will be sent on request. Your further inquiry is invited.

THE MASSACHUSETTS DEVELOPMENT AND INDUSTRIAL COMMISSION · STATE HOUSE, BOSTON, MASSACHUSETTS

IT'S PROFITABLE TO PRODUCE IN MASSACHUSETTS

IT'S GOOD BUSINESS *to use good* BRUSHES

SPECIFY Osborn Brushes

(Reading time: 29 seconds or less)

● Costs were reduced approximately 17% on a production operation by using Osborn Brushes carefully selected to meet the job requirements. Formerly, strip metal was cleaned and polished by drawing it through steel wool. Better, faster, easier work is obtained at less cost by feeding the strip metal through a machine equipped with Osborn Wire Wheel Brushes, as illustrated. It's good business to use good brushes *properly matched to job conditions.*

Osborn and the Osborn Distributor in your locality can help YOU gain the cost saving advantages provided by Osborn Brushes. *Ask about it!*

THE OSBORN MANUFACTURING COMPANY • 5401 HAMILTON AVENUE • CLEVELAND, OHIO

It is easy to speed up greasing operations...

when you use

LINCOLN INDUSTRIAL LUBRICATING EQUIPMENT

Model 1780 (illustrated below) pumps grease from original 400-lb. drum into units passing along assembly line . . . .

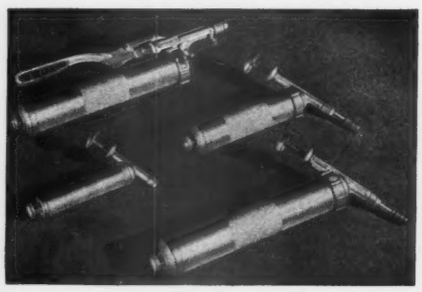
Model 1780

If you make a product that requires grease lubrication before it leaves the factory—it will pay you to confer with your nearest Lincoln distributor. It is very probable that your lubrication service problems can be solved, your service speeded up and economies effected by the proper selection of standard units from the complete line of Lincoln Lubricating Equipment.

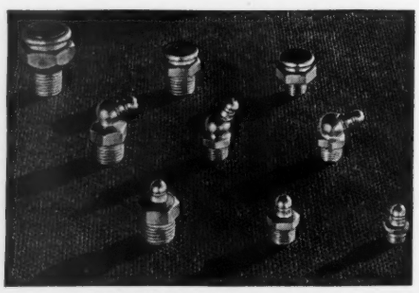
The Lincoln Airline Lubrigun, shown at left, is a typical heavy-duty, air operated unit for dispensing lubricant directly from an original 400-lb. drum. Designed for service where high pressure is required to force lubricant through a fitting into a closely fitted bearing or through a long system of piping.

Other items in the Lincoln line include hand guns ranging from 3½ ozs. capacity up to lever guns having 18 oz. capacity . . . Also power operated units ranging from 1-lb. to 400-lbs. capacity, and a complete line of Lincoln KLEENSEAL and Button Head Fittings.

Obtain complete information through your nearest Lincoln distributor—or write us for Catalog No. 60.



A few of the many types of hand operated Lincoln Grease Guns are shown above. The complete line is shown in Catalog No. 60.



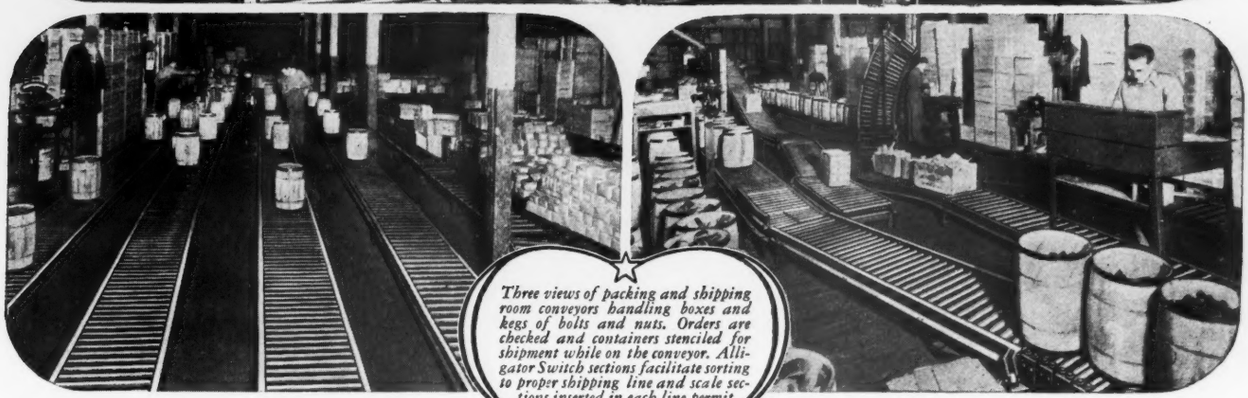
Lincoln KLEENSEAL and Button Head Fittings in all types and sizes are available for replacement and modernization needs.

LINCOLN ENGINEERING COMPANY

PIONEER BUILDERS OF LUBRICATING EQUIPMENT

GENERAL OFFICES, ST. LOUIS, MO. FACTORIES: ST. LOUIS, MO., DETROIT, MICH.

The SURE WAY to Quick Profits



Three views of packing and shipping room conveyors handling boxes and kegs of bolts and nuts. Orders are checked and containers stenciled for shipment while on the conveyor. Alligator Switch sections facilitate sorting to proper shipping line and scale sections inserted in each line permit weighing in transit.

QUICK profits through savings in time, effort, space, breakage, or inventory. Costly machines kept operating to capacity. Production schedules maintained through pace setting effect. These are some of the results which justify labeling conveyors the *sure way* to quick profits.

Conveyors have become an integral part of many manufacturing operations. They are usually the essential element in continuous flow production—for incoming raw materials, parts through processing and assembly, finished product to storage or shipment. *The average conveyor installation pays for itself in one year, frequently in a few months.*

For maximum savings, expert planning and a thorough understanding of the user's requirements are essential. Whether it is only a few sections at a single operation or a complete system the nearest Logan engineer is at your service without obligation. Logan Co., Incorporated,
510 Buchanan Street,
Louisville, Kentucky.

MOVING IS 90% OF MAKING

Logan Conveyors
LOUISVILLE

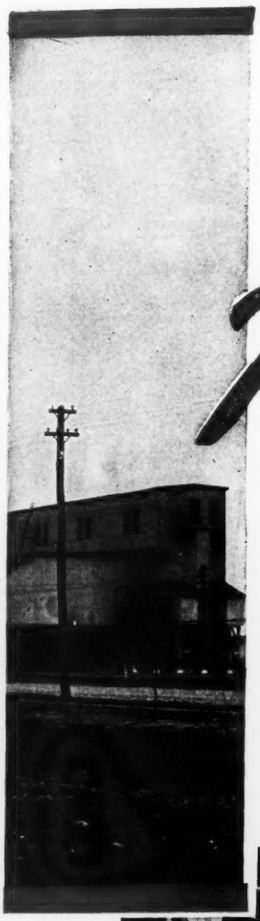
BIG SUGAR

General view of refinery at Reserve, Louisiana, of Godchaux Sugars, Inc. At the left are typical packages of the Godchaux products, 2,000,000 pounds of which are refined each 24 hours.

TEXACO

TEXACO

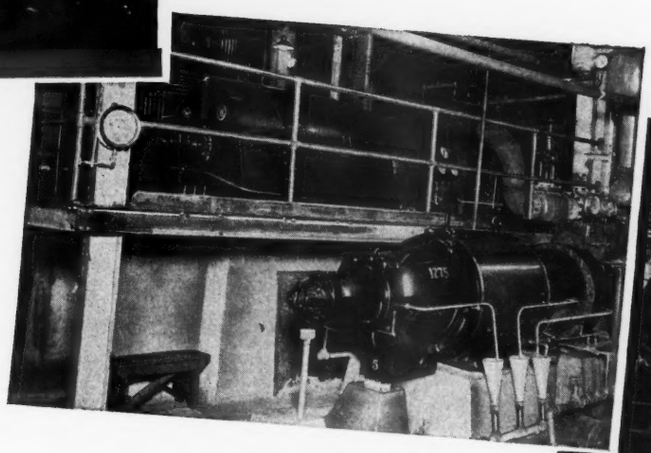
REFINERY *GETS* *sweet performance*



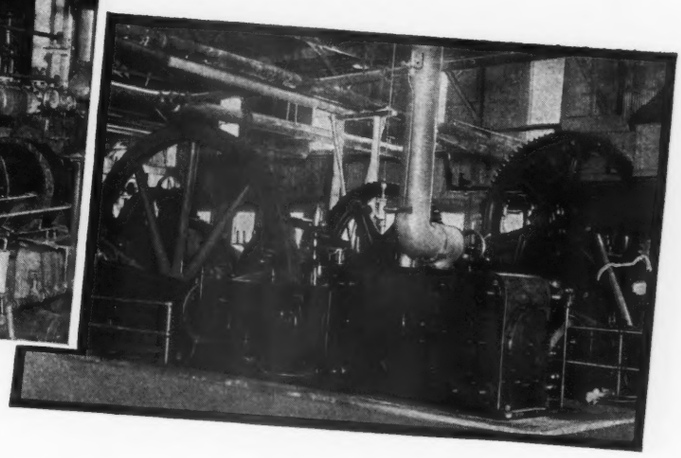
ONE OF THE LARGEST and best known refineries in the Louisiana area, Godchaux Sugars, Inc., of Reserve, Louisiana, operates a power plant well known for its general efficiency. One of the reasons for this efficiency is the lubrication of the prime movers. In both the turbines and reciprocating engines, Texaco Lubricants have been in use for years.

For higher lubricating efficiency in *your* plant, get in touch with Texaco through the nearest of our 2186 warehouses. Texaco lubrication engineers offer their help in selecting and applying the right lubricants.

The Texas Company, 135 East 42nd Street, New York.



Westinghouse Turbo-Generator in Godchaux Sugars power plant. This machine and 2 other turbines are lubricated with Texaco Regal Oil.



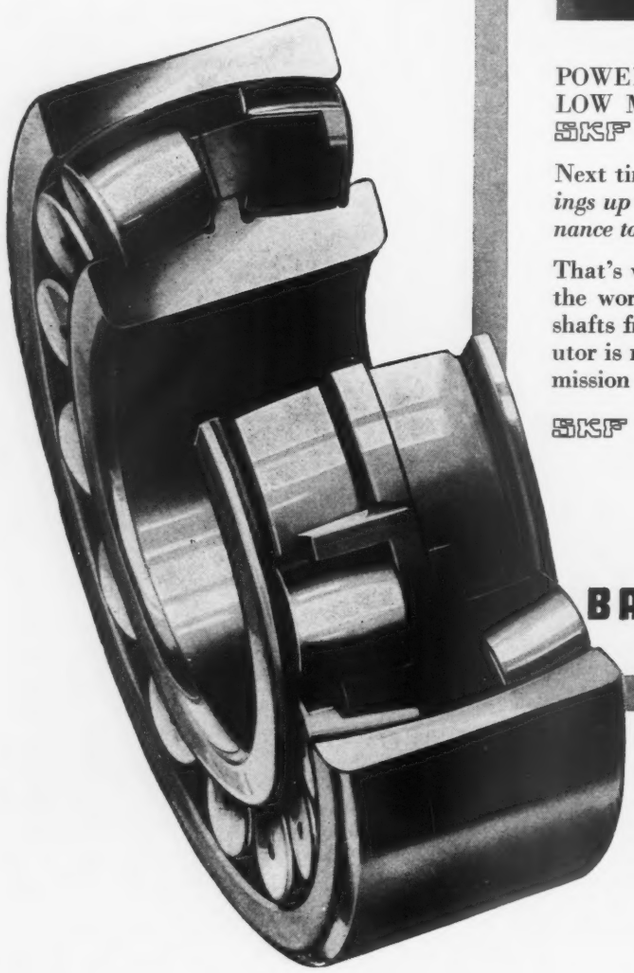
Corliss Engine, size 28" x 72", driving grinding mill This unit has used Texaco Pinnacle Cylinder Oil for more than 11 years.

INDUSTRIAL LUBRICANTS

THERE ARE 3 QUICK WAYS TO PROFITS WHEN YOU

SPECIFY SKF

● SKF *makes more types and sizes of ball and roller bearings than any other manufacturer in the world.*



POWER SAVINGS, LUBRICATION ECONOMIES AND LOW MAINTENANCE are three quick ways to profits with SKF Hangers and Pillow Blocks.

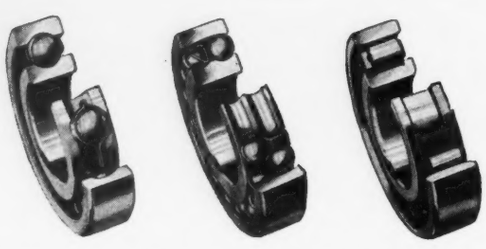
Next time you pay the bills, remember SKF bring about *savings up to 35% in power, 80% in lubrication, and reduce maintenance to a vanishing point because they require no adjustments.*

That's why more than 18,000,000 SKF transmission bearings the world over are paying for themselves within two years on shafts from ⅝″ to 30″ in diameter. Your nearest SKF distributor is ready to help you capitalize immediately on your transmission equipment. See him, or write direct. 4205

SKF INDUSTRIES, INC., PHILADELPHIA, PA.

SKF

BALL AND ROLLER BEARINGS



the Screw goes straight

A rough character he was, see . . . a constant headache in every plant he ever worked in. Crooked every chance he got . . . wasting time, spoiling work, bogging down production. Liked by nobody — and when in a jam, what a nasty job of cutting up he could do!

Then something came over The Screw. Took that slot off his head and put in a patented recess. Changed his habits altogether. Guarantees now never to go crooked again, to use his head and really save some money.

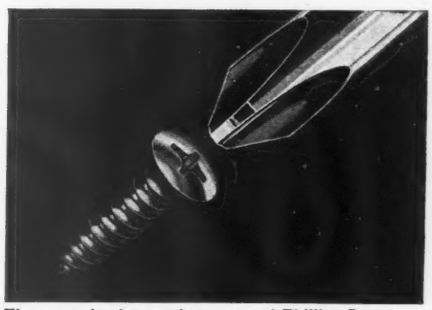
The crew took to him like your wife to a pay envelope. He's on the ball from whistle to whistle, and no foolin'! Makes it easy for the guy that's doing the driving, because you can depend on him to keep the driver from slipping. No more burrs — really a smooth article now. And I don't know of a crooked job he's done since he made his comeback.

The boss says he's worth his weight in gold. The Screw has gone straight — and you can lay your cash on that!

Manufacturers Report Assembly Costs Cut Up To 50% . . .

Even when working in an awkward position or on pre-finished parts, it's safe to use faster driving methods. The screw clings to the driver, the driver can't slip from the screw, and the screw can't go in crooked. Freedom from burrs saves an extra filing operation. Result: 10 to 30 minutes saved each assembly hour.

Workers, foreman and cost departments all agree that "It's faster, safer and cheaper to drive Phillips." Folder B contains all the facts. Address one of the firms listed below for a free copy.



The recess in the genuine patented Phillips Screw was carefully designed to make the most efficient use of the driver's turning power. It presents three times the contact of the slotted screw, reducing effort required. 2 Phillips Drivers fit 85% screw sizes commonly used.

RECESSED HEAD

PHILLIPS SCREWS

Gain Time . . . Guide-Driver . . . Guard Work

MACHINE SCREWS SHEET METAL SCREWS WOOD SCREWS STOVE BOLTS

U. S. Patents on Product and Methods Nos. 2,046,343; 2,046,837; 2,046,839; 2,046,840; 2,082,085; 2,084,078; 2,084,079; 2,090,338. Other Domestic and Foreign Patents Allowed and Pending.

American Screw Company, Licensee
Providence, Rhode Island

Continental Screw Company
New Bedford, Massachusetts

Corbin Screw Corporation
New Britain, Connecticut

National Screw & Manufacturing Company
Cleveland, Ohio

Parker-Kalon Corporation
New York, New York

Russell, Burdsall & Ward Bolt & Nut Company
Port Chester, New York

SEND ME FOLDER B ON PHILLIPS SCREWS! (Address your inquiry to one of the firms listed above.)

Name.....

Company..... Products.....

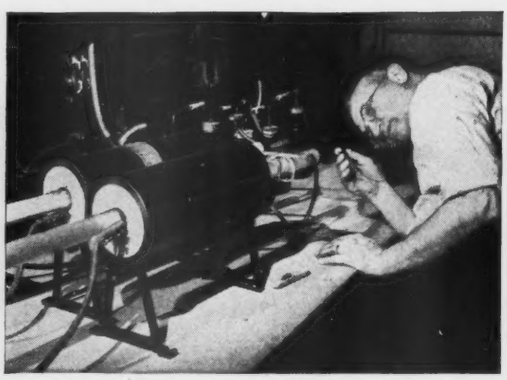
Address.....

LESS THAN 5¢ A MOTOR

Weave shed at Pequot Mills, where 4,000 G-E motors have operated so dependably for over 20 years

G-E MOTORS PASS ALL TESTS

EPSTEIN TEST—Silicon steel for rotor and stator laminations is given the Epstein test to assure high permeability and low core loss



CARBON TEST—Steel and cast iron are tested for carbon content to make sure that they meet the high G-E physical-property standards

CONDUCTIVITY TEST—Aluminum is tested for conductivity before it goes into the indestructible rotors—assuring economical operation

GENERAL ELECTRIC

020-371

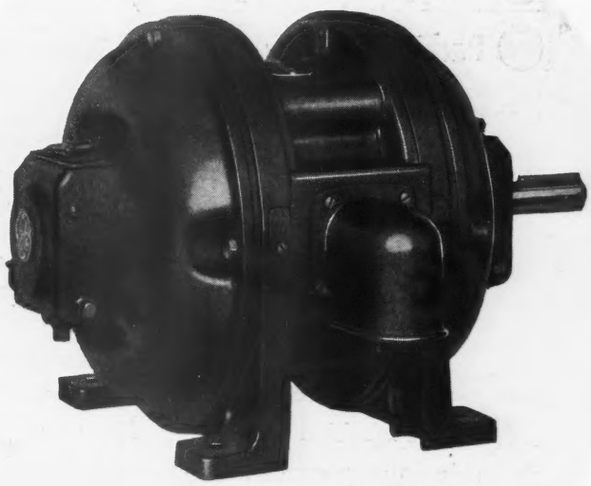
per YEAR for MAINTENANCE

4000 G-E motors pass 20-year performance test at Pequot Mills

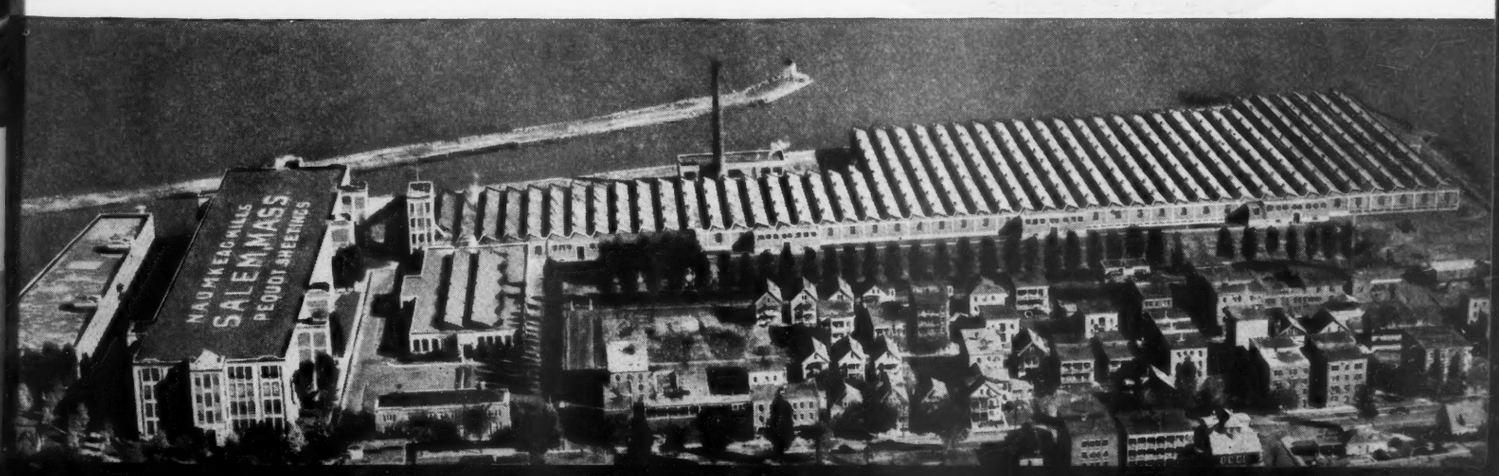
MORE than 20 years ago 4,000 General Electric motors were installed in the mammoth weave shed of the well known Pequot Mills at Salem, Massachusetts. The records show that less than five cents a motor per year was spent on repairs and maintenance. They also show that these 4,000 motors have operated for an average of 41 hours a week, 50 weeks a year, since they were installed in 1915—and are continuing this remarkable record.

This performance test proved that motor maintenance was a negligible item in the expenses which determine cost per pound of goods produced. In fact, the figures showed that expenses for G-E motor parts and motor service averaged only four and one-quarter cents per motor per year. Add to this low maintenance the savings that the reliable performance of these motors made possible by preventing costly delays and spoilage, and you can appreciate the advantage of specifying G-E motors.

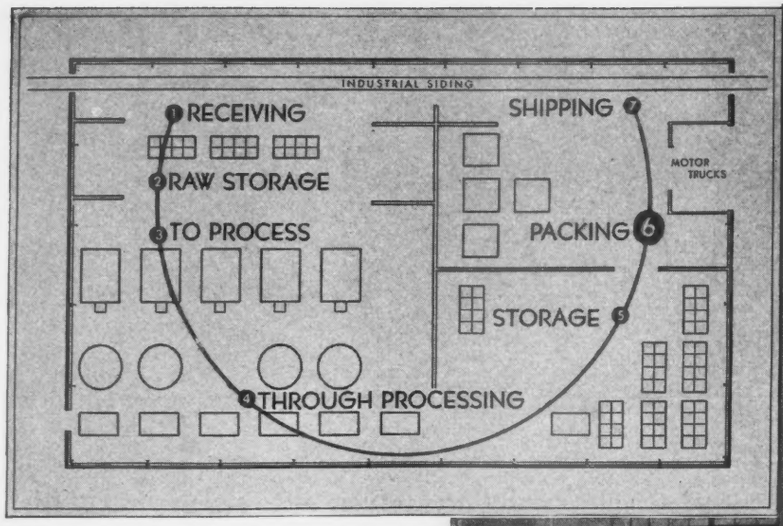
For 60 years General Electric has been assisting an increasing number of purchasers to obtain continued, reliable, satisfactory service and profitable results from their investment in electric equipment. G-E motors pass such performance tests because material and workmanship that go into them are—and must be—of the best quality. Shown at the left are three reasons why G-E motors PASS ALL TESTS and why you are assured that they will meet performance tests in your plant. General Electric, Schenectady, N.Y.



Typical G-E induction motor designed to give you more value *in actual performance* for your motor dollar



Aerial view of the Pequot Mills, Salem. The section at the right shows one of the largest weave sheds in the world—housing 4,000 looms, each powered by General Electric Motors



WARNER & SWASEY LAID OUT THEIR PLANT FOR *Low Cost* HANDLING • • ELWELL-PARKER FURNISHED THE TRUCKS *20 Years Apart*

1. Car to Receiving
2. Receiving to Storage
3. Storage to Process
4. Through Processing
5. Process into Storage
6. Storage to Packing
7. Packing into Car

Floor layouts in the great Warner & Swasey plant provide for high-speed, economical load transportation by Power Industrial Trucks. The Company capitalized fully upon this advantage.

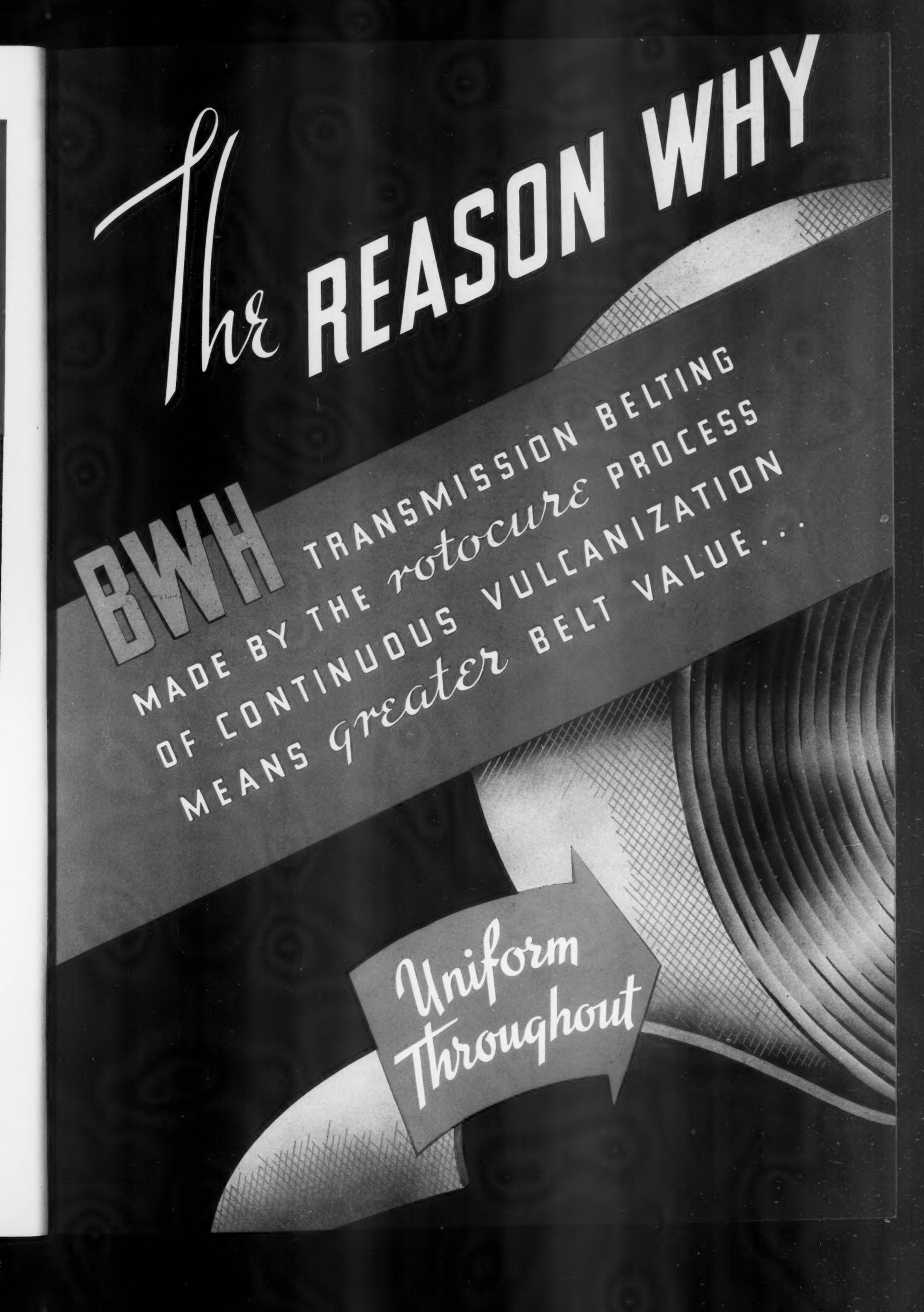
In the "6th Step" of modern manufacturing—transportation of loads from storage to packing—these two Elwell-Parker Platform Trucks help deliver Machine Tools from erecting room to shipping department. Both are of the same type. But *one* was bought in 1917 and one in 1937!

The photograph shows the radical improvements effected in Elwell-Parkers during these 20 years. Warner & Swasey Turret Lathes are constantly being re-designed and modernized. This Company's selection of more Elwell-Parkers is an appreciated tribute to excellence in engineering and construction which has conclusively proven dependability and low-cost upkeep.

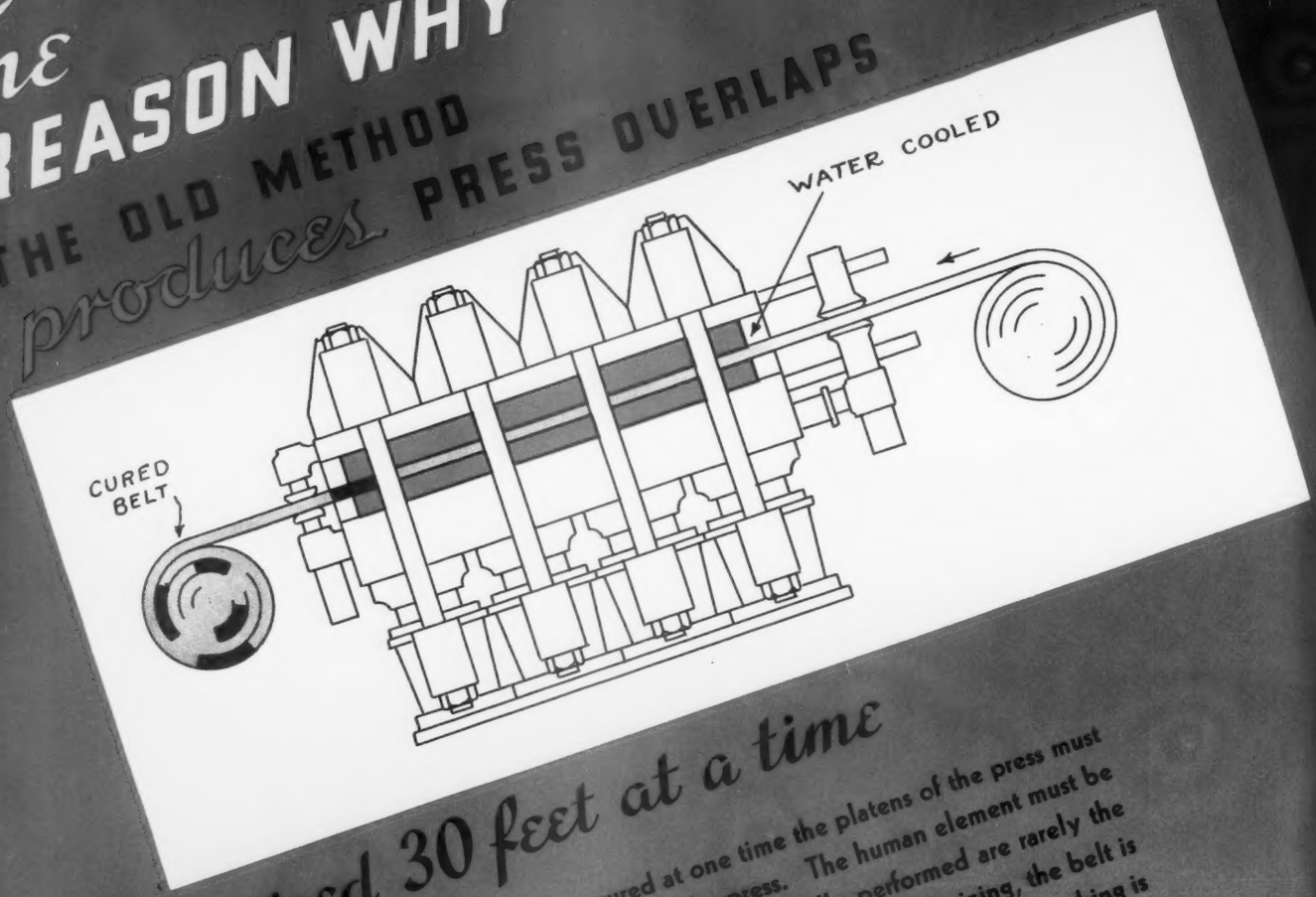
Doesn't this 20-year, repeat-order record say that you too should *keep* modern in your own load-transportation? Your present methods may be destroying profits you have earned elsewhere. An Elwell-Parker Engineer will help you find out quickly. Wire for him now—COLLECT. The Elwell-Parker Electric Company, 4323 St. Clair Avenue, Cleveland, Ohio.

ELWELL-PARKER *Power Industrial* TRUCKS

ESTABLISHED 1893 • BUILDING POWER INDUSTRIAL TRUCKS SINCE 1906


The REASON WHY
BWH TRANSMISSION BELTING
MADE BY THE rotocure PROCESS
OF CONTINUOUS VULCANIZATION
MEANS greater BELT VALUE...
Uniform Throughout

The REASON WHY THE OLD METHOD produces PRESS OVERLAPS



Vulcanized 30 feet at a time

When only 30 feet of belt can be cured at one time the platens of the press must be raised and the next 30 feet drawn into the press. The human element must be depended upon; yet it is true that operations manually performed are rarely the same when repeated. When placed in the press ready for vulcanizing, the belt is supposed to be stretched a definite percentage. Careful control of this stretching is essential; otherwise the belt may stretch abnormally or even break in service. The accuracy of this control depends on the conscience and alertness of the operator. Nevertheless he is expected to open the press at exactly the right minute, pull the belt exactly the right distance, and stretch the belt the exact number of inches. On all belts made in the platen press there is at the end of each press length a narrow section which is vulcanized twice, with resulting distortion and injury of fabric, and since over-vulcanization is destructive we now have a belt with injured strips—three potential defects in approximately every 100 feet of belting. Such a belt is partially crippled when it goes on the drive. The result: a variable stretch factor and a definite decrease in resistance to flexing and ply separation in service.

BOSTON WOVEN HOSE

The REASON WHY

THE NEW METHOD *eliminates* PRESS OVERLAPS

Manufacturers of rubber belting have tried many methods of eliminating press overlaps. Flat presses equipped with water-cooled ends were developed, but the difficulty was only partially overcome because, with the most skillful operators, over-vulcanization still prevailed. Another expedient was to so change the compounding of the rubber as to minimize the effect of over-vulcanization, but here again the device was a makeshift rather than a solution, with the result that the difficulty remained unsolved.

The BWH Rotocure Process of Continuous Vulcanization is the only practical method of producing uniform rubber belting entirely free from press overlaps. It solves the problem because the belting is processed on an exclusive patented rotary type of press, radical in principle. It substitutes uniformity for variation by making the vulcanizing process automatic instead of spasmodic. Uniformity results not from the skill or experience of the operator, but from the unvarying precision of the machine. The result: a uniform belt uniformly vulcanized and uniformly stretched, that will give uniform service.

one continuous operation

E & RUBBER COMPANY

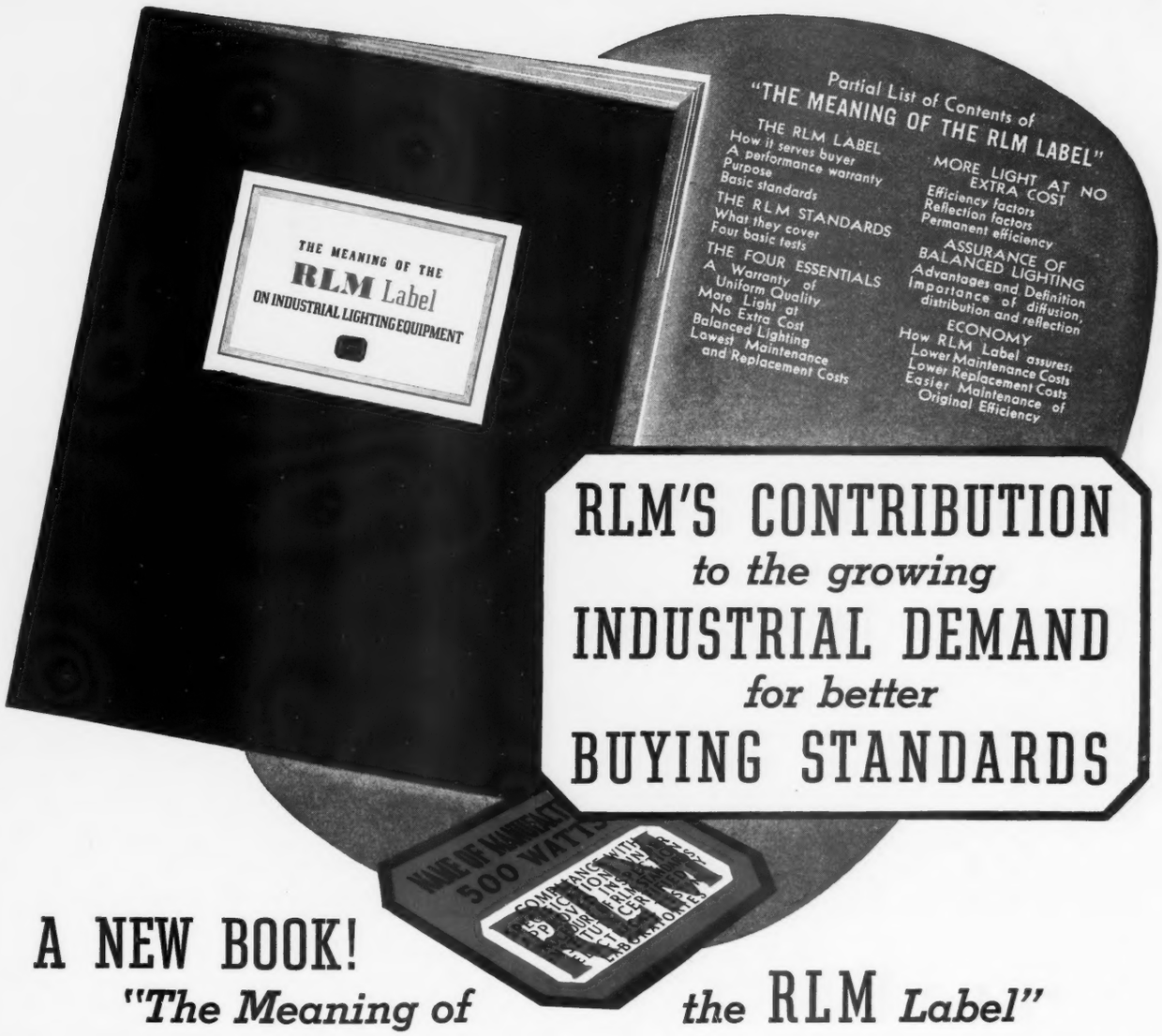
The 3 leading brands of BWH BELTING

MADE BY THE ROTOCURE PROCESS OF CONTINUOUS VULCANIZATION

The advantages of continuously vulcanized belts and the economy which they represent in the operation of your plant cost you nothing. BWH belts, made by this process, are competitive in price. You pay no premium for this extra measure of quality and service. It is only necessary to order belting by name and specify the BWH brand which best suits your service requirements.

BOSTON WOVEN HOSE & RUBBER COMPANY

Continuous vulcanization is a contribution to industrial economy, developed solely by the Boston Woven Hose & Rubber Company in its works at Cambridge, Mass., U.S.A., an organization engaged not merely in manufacturing and selling but in maintaining and increasing its reputation for extra-service rubber products.



RLM'S CONTRIBUTION
to the growing
INDUSTRIAL DEMAND
for better
BUYING STANDARDS

A NEW BOOK!
"The Meaning of the RLM *Label"*

Today more than ever before, those who purchase and specify products for use in industry are insisting upon basic standards by which they may judge accurately the value of the product from quality and performance standpoints.

In the field of Industrial Light Conditioning, the RLM STANDARDS INSTITUTE is meeting this demand by establishing standards of efficiency, design and quality for Industrial Lighting Reflectors.

The necessity for these standards, what they are and how they may be used to insure proper specification of lighting equipment from both the viewpoint of cost and performance is the subject of the booklet—"The Meaning of the RLM Label."

Into the book has gone the composite experience and knowledge of the engineering departments of the leading manufacturers of lighting reflectors associated in the RLM STANDARDS INSTITUTE.

This book is available without cost to industrial executives, consulting engineers, illuminating engineers, plant engineers, purchasing agents and all others interested in the proper specification and installation of industrial lighting equipment. Your request for a copy is most cordially invited.

The letters RLM stand for Reflector and Lighting equipment Manufacturers

RLM STANDARDS INSTITUTE
INCORPORATED

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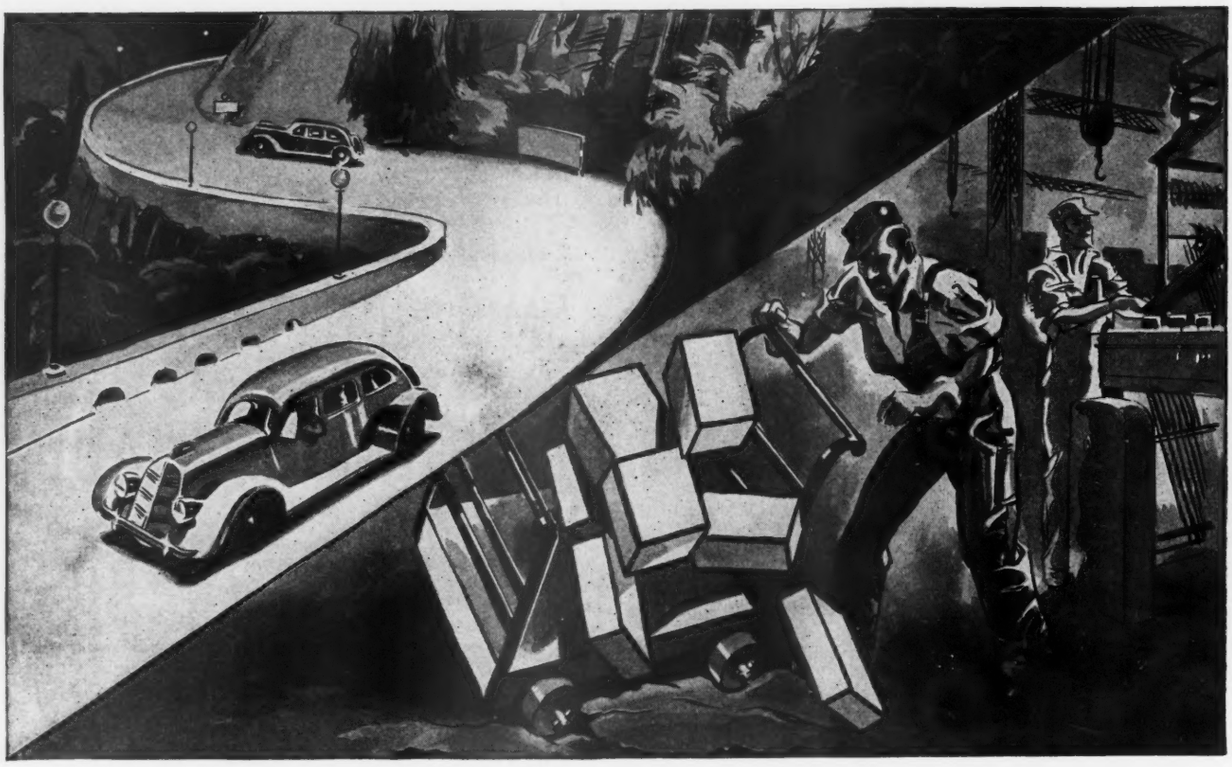
THE CERTIFICATE OF UNIFORM QUALITY

You want a clear, smooth road when driving—



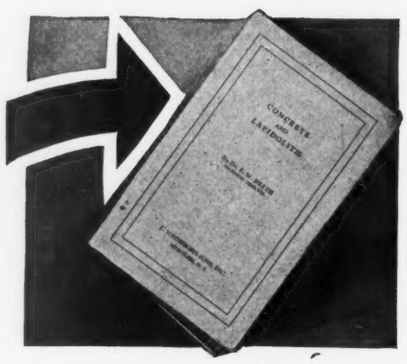
why be satisfied with hazardous concrete floors that Dust & Crack-up!

Concrete floors, unless specially hardened, will not hold their surface under grinding use. They wear down or crumble. They become dusty, dangerous to health, machinery and merchandise.

LAPIDOLITH, the original concrete floor hardener, will make your floors wearproof, waterproof, dustproof. It is a liquid, chemical compound that penetrates the pores of cement and makes floors granite-hard for a lifetime.

LAPIDOLITH goes on a floor as easily as water. Any workman can apply it. If preferred, our own service crew will apply LAPIDOLITH anywhere.

Leading builders and architects have been using LAPIDOLITH for years, in many of the most important factories, office buildings, stores and institutions in America. We will gladly send you a list of treated concrete floors in your city which are still like flint after years of use.



Send for this free book, entitled "Concrete and Lapidolith" by Dr. F. W. Breth, which explains how to preserve concrete.

Address Dept. FM 11

L. SONNEBORN SONS, INC. 88 Lexington Ave., New York City

PLANT MEN SAY...

"We're making better production records...

"We've trimmed our maintenance costs to the bone...

"We avoid operating interruptions and time-out-of-service...

...*with* GULF'S HIGHER QUALITY *lubricants!*"

IT'S real economy to invest a few cents more per gallon in *quality* lubricants when such operating improvements as these can be made! *Better production records, lower maintenance costs, less time-out-of-service*—those are the benefits by which progressive plant men measure the true value of Gulf's higher quality oils and greases.

Your operating men may be getting by with "run-of-the-mine" lubricants. But if you're not entirely satisfied with your plant production—from the standpoint of quality, quantity or *costs*—we suggest that you give special attention to the matter of lubrication.

Let an experienced Gulf engineer check over your equipment and recommend possible means of improving lubrication practice. He works tactfully with plant men, has a keen appreciation of their problems and will be an able ally in their attack on friction, wear and machine inefficiency. Gulf Oil Corporation—Gulf Refining Company, Gulf Building, Pittsburgh, Pa.

GULF INDUSTRIAL LUBRICATION

"We avoided a rewiring job on our Grinder . . .
by installing
BUSS Super Lag
FUSES"!
BUSS
SUPER-LAG

SO SAYS:—*Mr. Arthur Holmes, Chief Electrician, Ingersoll Milling Machine Co., Rockford, Ill.* "Shutdowns were occurring an average of five times weekly on temporary starting loads on a grinder powered by a 20 H.P., 220 V. three phase squirrel cage motor fused with ordinary renewable fuses of 100 amp. capacity.

"Severe production penalties due thereto caused me to install 100 amp. BUSS SUPER-LAG FUSES, along about the first of this year, and to date we haven't had a single fuse blow on this circuit.

"Not only have we disposed of the annoyance and expense entailed by the former situation but we were saved the cost of installing a larger sized switch, with larger fuses, which surely would have been necessary had we continued with ordinary fuses."

Avoiding Installation Costs Is Only a Part of the Savings Buss Fuses Can Make in Your Plant

The big saving with BUSS Super-Lag Fuses comes from the elimination of needless blows with their resultant costly shutdowns.

Prevention of needless blows is accomplished thru two scientifically worked out features:—

1. The design of the FUSE-CASE is such that it guards the fuse link against possible injury while renewing the fuse—and it MAKES and MAINTAINS good contact on the fuse link.

Given good contact in the clips, a BUSS fuse will carry continuously its full rating. Users are not annoyed by fuses blowing because of faulty design.

2. The Super-Lag development in the FUSE-LINK gives BUSS fuses a time-lag sufficient to hold harmless overloads such as those caused by two or more motors starting simultaneously or a machine not getting up to speed quickly or other such common condition.

With BUSS Super-Lag fuses the circuit is not shut down needlessly—useless shutdowns that cause machines and workers to stand idle are avoided.

For a comparison of the BUSS design with others ask for a free copy of the "Rb" book—or better still...

Give your plant this low cost protection, by passing the word down the line that all purchase orders and requisitions must call for BUSS Super-Lag Fuses.

BUSSMANN MFG. CO.
UNIVERSITY AT JEFFERSON
ST. LOUIS, MO.
Division of McGraw Electric Company

WHY BUSS FUSES
DON'T BLOW NEEDLESSLY
10 FEATURES
in the design of the FUSE-CASE help make it possible..
The SUPER-LAG
development in the FUSE-LINK completes the job.

BUSS *Super Lag* FUSE

Before THEY'RE BIG ENOUGH TO SEE TEMPERATURE CHANGES ARE *Headed Off*

Suppose you are hand-regulating the temperature of a process from a Micromax record. Every time you see a change, you turn your valve or damper. But, unless you hold a glass on the record, you can't do the kind of job the instrument itself will do when equipped for automatic control.

For a controlling Micromax acts on changes before they are big enough to see — goes into action with a time margin which makes its work better than a man's best and better than the best pre-Micromax automatic control.

The success of this "micro-action" in minimizing temperature changes, making large ones small and heading off most small ones altogether, sets new standards for control.

Write for
CATALOG ON MICROMAX CONTROL

LEEDS & NORTHRUP COMPANY, 4909 STENTON AVE., PHILA., PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

Jrl. Ad N33(23)

★HERE'S NEWS!

BULL DOG UNIVERSAL

Trol-E-Duct

NOW AVAILABLE IN THE 5-FOOT HANDY SET

The HANDY 5-FT. SET Includes:

1. 5-foot Section of Duct in which two Busbar Conductors are mounted.
2. Feed-In End Cap.
3. Trolley Entrance End Cap.
4. Two Supporting Hangers.
5. 5-Foot Cord with Attachment Plug.
6. Trolley; Terminal Type or Receptacle Type.

Make This LOW COST TRY-OUT in YOUR Plant . . .

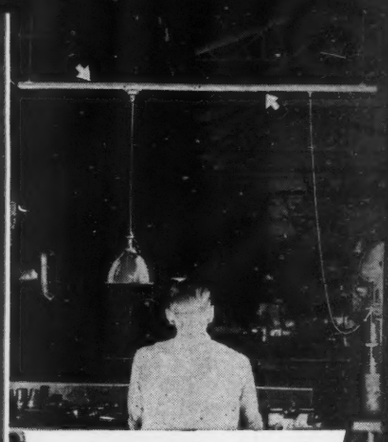
Install a Bull Dog Trol-E-Duct 5-FOOT HANDY SET at some point where conventional outlets for lighting or small electrical tools have proved inconvenient . . . . SEE how this modern system of mobile electrical distribution outlets works to SAVE TIME, INCREASE EFFICIENCY and promote ECONOMY.

It takes only a few minutes to install this 5-foot duct run, every inch of which is a potential electrical outlet or source of current for lights or portable tools. Movable trolleys or twist out plugs make it possible for the operator to quickly and easily move the various electrical devices to just the right location for peak efficiency on any operation.

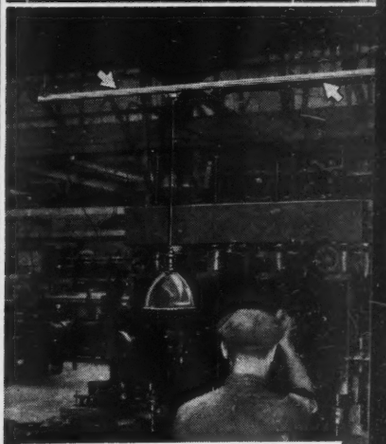
The initial cost of this HANDY SET is so neglible, its applications so universal, that there are certain to be locations in your plant where its use will be most practicable.

It can be carried from one place to another to provide outlets where needed—it can be removed as a unit and re-installed without any loss. Of course Universal Trol-E-Duct is also available in unit sections which can be coupled together to form a continuous run of any desired length.

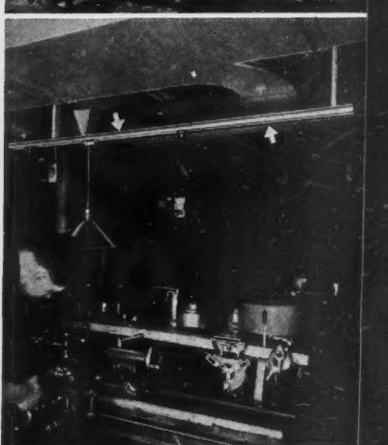
Order your 5-Foot Handy Sets Through Your Local Bull Dog Electrical Jobber.



Die Department Installation. In this Die Department, movable lighting for workers and instant power for various electric devices are easily available through Trol-E-Duct.



Installation Over Drill Press. The operator of this 4-spindle Drill finds the convenience and efficiency of Trol-E-Duct's movable lighting conducive to good work.



Light and Power for Lathe. Easily Installed. Trol-E-Duct provides movable lighting and convenient power for all types of machines in Factories and Home Work Shops.

Installation Views, shown above, indicate the versatility of application of the Bull Dog Universal Trol-E-Duct 5-FOOT HANDY SET. There are, no doubt, many similar situations where it can be profitably utilized in your plant.

BULL DOG ELECTRIC PRODUCTS COMPANY

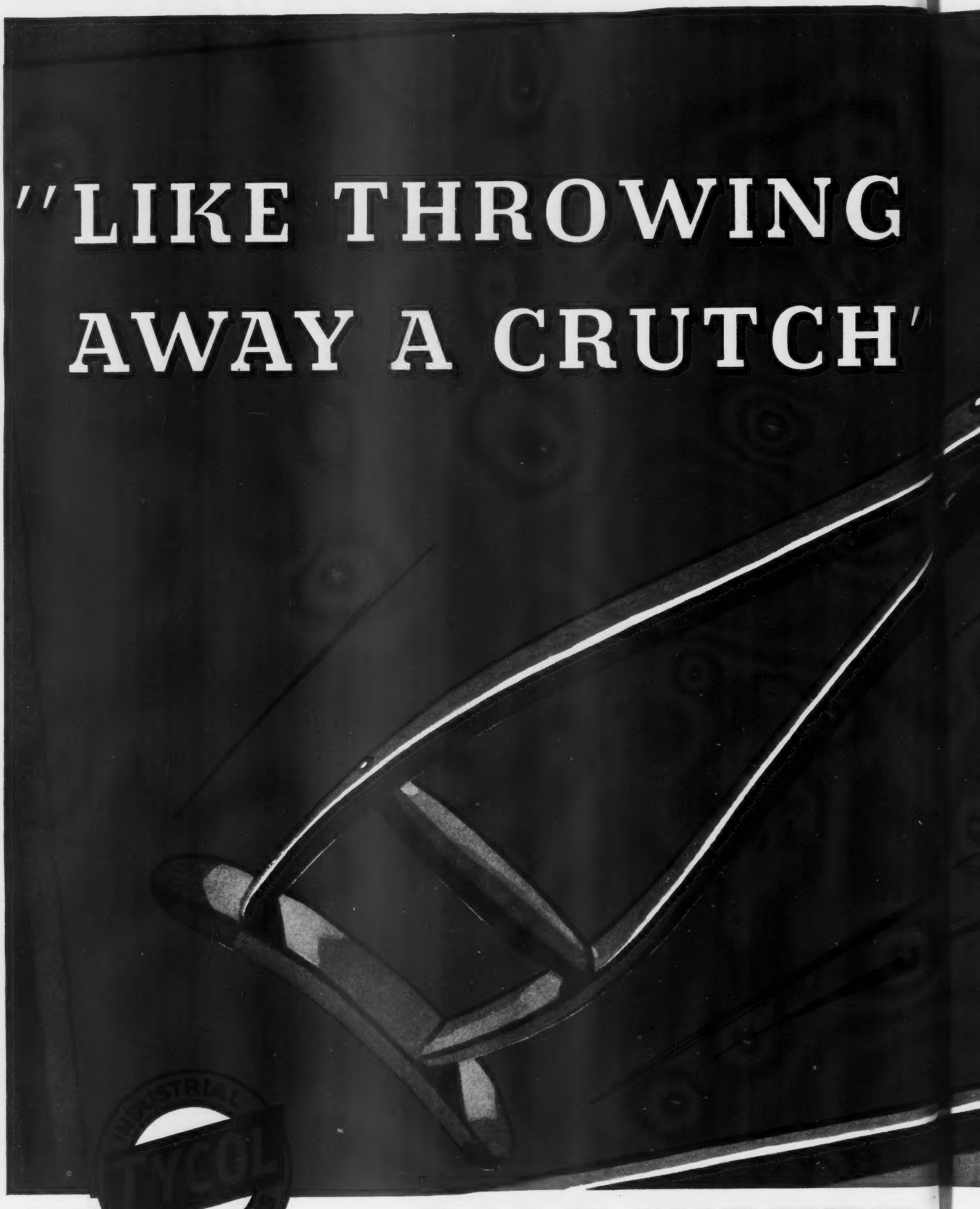
Pioneers of Flexible Electrical Distribution Systems

DETROIT, MICHIGAN

MANUFACTURERS OF VACU-BREAK SAFETY SWITCHES, PANELBOARDS, SWITCHBOARDS, DUCT SYSTEMS

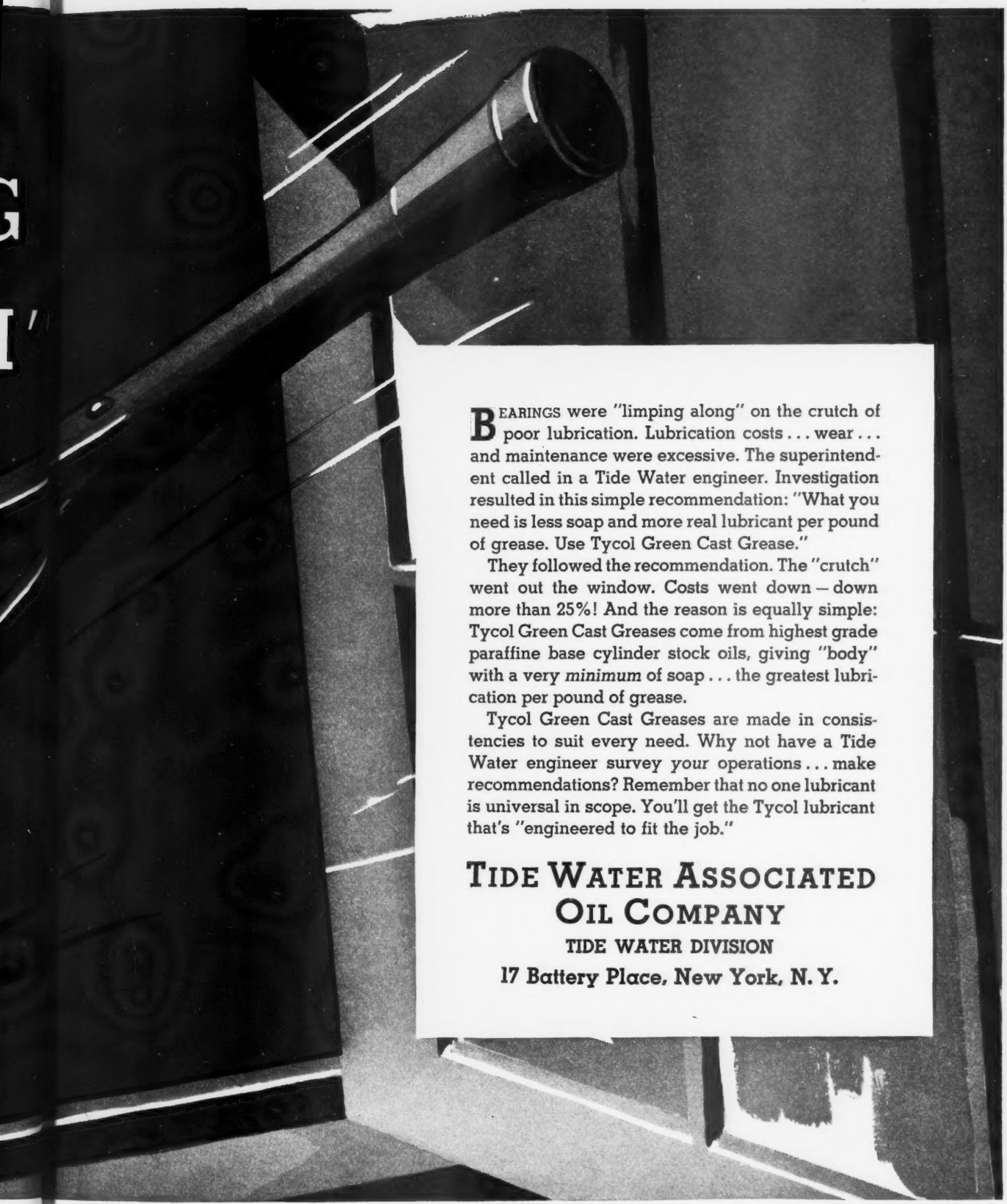
BULL DOG ELECTRIC PRODUCTS CO. OF CANADA, LTD., TORONTO, ONT.

"LIKE THROWING AWAY A CRUTCH"



TIDE WATER

THERE IS A COMPLETE LINE OF TYCOL LUBRICANTS



BEARINGS were "limping along" on the crutch of poor lubrication. Lubrication costs . . . wear . . . and maintenance were excessive. The superintendent called in a Tide Water engineer. Investigation resulted in this simple recommendation: "What you need is less soap and more real lubricant per pound of grease. Use Tycol Green Cast Grease."

They followed the recommendation. The "crutch" went out the window. Costs went down — down more than 25%! And the reason is equally simple: Tycol Green Cast Greases come from highest grade paraffine base cylinder stock oils, giving "body" with a very *minimum* of soap . . . the greatest lubrication per pound of grease.

Tycol Green Cast Greases are made in consistencies to suit every need. Why not have a Tide Water engineer survey *your* operations . . . make recommendations? Remember that no one lubricant is universal in scope. You'll get the Tycol lubricant that's "engineered to fit the job."

TIDE WATER ASSOCIATED OIL COMPANY

TIDE WATER DIVISION

17 Battery Place, New York, N. Y.

GREEN CAST GREASES

SCIENTIFICALLY ENGINEERED FOR EVERY INDUSTRIAL USE

Partial List of

BROWN Air-O-Line

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Pension Oil Co.
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Republic Steel Corp.
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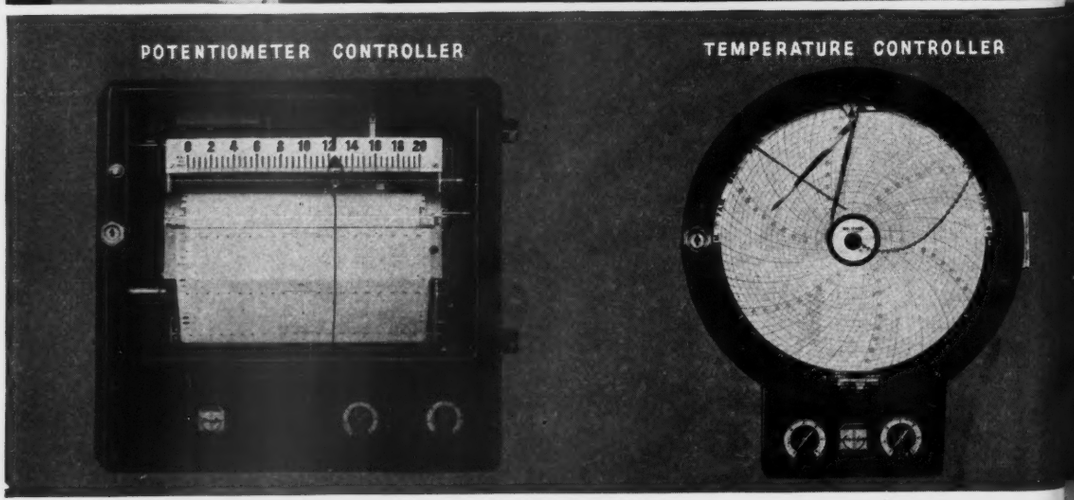
"TUNING IN" GETS RESULTS
"TUNING IN" SAVES TIME
"TUNING IN" CUTS COSTS
"TUNING IN" INCREASES PRODUCTION
"TUNING IN" BALANCES OPERATION
"TUNING IN" ELIMINATES GUESSWORK



BROWN AIR

"TUNING IN"
PROCESS CONTROL
Assures Increased Profits

Complete coordination in the regulation of such variables as temperature, pressure, flow and liquid levels is a vital factor in process control. Without this coordination, unbalanced operation results—causing a loss in time and higher operating costs.

Through the use of Graduated Dials for "Tuning In" Throttling Range and Automatic Reset, Brown *Air-O-Line* Controllers provide extreme accuracy and flexibility in coordinating and controlling process variables . . . First, by the simplicity with which *Air-O-Line* is "tuned in" to process control; Second, by the extreme precision with which it maintains control. Brown *Air-O-Line* Controllers have reduced the most complicated process control problem to the simplicity of dialing a radio. Once "tuned in", they become fully automatic and guess work is eliminated.

When discriminating buyers of leading industries insist upon proof of a controller's merit—then order and re-order Brown *Air-O-Line* Controllers in constantly increasing quantities, it can only mean one thing—Brown *Air-O-Line* Controllers must fulfill every exact requirement and provide outstanding performance with simplicity.

Write for Catalog No. 8902. THE BROWN INSTRUMENT COMPANY, *a division of Minneapolis-Honeywell Regulator Co.*, 4461 Wayne Avenue, Philadelphia, Pa. Offices in all principal cities. Toronto, Canada: 117 Peter Street—Amsterdam-C, Holland: Wijdesteeg 4—London, England: 70 St. Thomas' Street, S.E.1.

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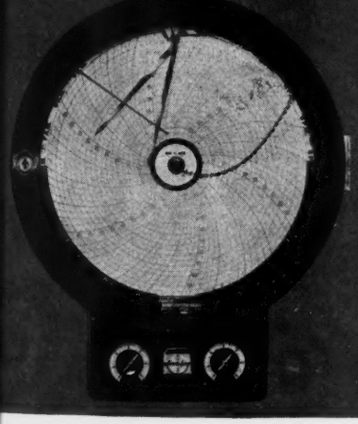

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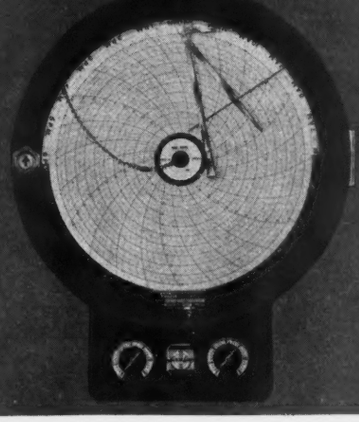
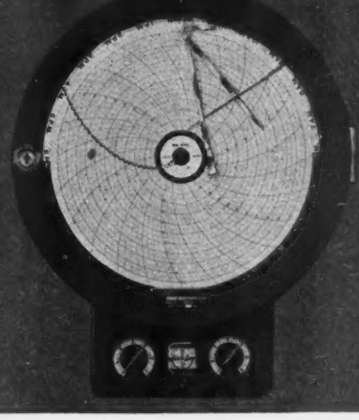


LIQUID LEVEL CONTROLLER



OPERATED CONTROLLERS

OUTSTANDING PERFORMANCE WITH SIMPLICITY

"Here it is 2 x 2½ x 3½"

SEND US YOUR BLUEPRINTS

Let us quote on your special bearings, designs and alloys. Our engineering and metallurgical staffs will collaborate without cost or obligation in making of bearing specifications for all applications. . . Our vast production facilities assure prompt service at attractive prices.

THE FIRST THING done in thousands of plants today when the need for bearings arises is to consult the Bunting Catalog. More often than not the exact bearing required is found among the hundreds of different sizes of Bunting Standardized Bearings and Electric Motor Bearings instantly available from stock. Write for your copy of the new Bunting 1939 Catalog. Ask your mill supply wholesaler for Bunting Bearings, Precision Bronze Bars and Babbitt . . . The Bunting Brass & Bronze Company, Toledo, Ohio. Warehouses in All Principal Cities.

BUNTING Quality

BRONZE BUSHINGS • BEARINGS
PRECISION BRONZE BARS
BABBITT METALS

A SPLENDID "KIT OF TOOLS"

1. To Help Reduce Costs and Wastes

Elliott Bulletin Board Service can do for production what advertising does for sales. A well-balanced plan of organization publicity to promote waste elimination, cost control, quality workmanship, safety, good housekeeping, cooperation, and good-will based upon a better understanding of management's problems. Write for illustrated descriptive folder.

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COST
MISTAKES and WASTE raise PRODUCTION COSTS
DIRT AND DISORDER Breed ACCIDENTS and WASTE!
Let's keep OUR Workplaces CLEAN and ORDERLY
A MESSAGE TO ALL EMPLOYEES
JOB SECURITY comes from SATISFIED CUSTOMERS

Weekly WASTE Display. Constant emphasis on workers' self-interest.

Weekly SAFETY Display. General reminders suited to all industry.

DAILY NEWS PICTURES attract workers to the boards every day.

MANAGEMENT'S PANEL for local news and official bulletins.

Weekly QUALITY Display constantly stressing how sales provide jobs.

2. To Help Increase Foreman Efficiency

A TRAINING AID USED BY OVER 1000 COMPANIES IN ALL KINDS OF INDUSTRY

"MANAGEMENT INFORMATION"

A weekly bulletin for department heads, supervisors and foremen, edited by Glenn Gardiner and Associates, provides a low cost, well-balanced program of practical guidance in cost control, waste elimination, safety, quality maintenance, methods improvement, training, worker psychology, organization relations, self-improvement, and human relations. Weekly problems and cases. Weekly articles on current industrial economics.

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ELLIOTT SERVICE COMPANY 219 EAST 44th STREET
ESTABLISHED 1911 NEW YORK CITY

Wherever Metal is Ground . . .

NORTON WHEELS

FOR each new development in metals—a Norton abrasive development to meet it. Examples:

The new B-E bond for more effective grinding of high speed tool steels and for more efficient centerless, cylindrical, internal and surface grinding.

Improved cut-off wheels for the production cutting of the new super-hard alloy steels.

Diamond wheels for grinding the cemented carbides.

Norbide abrasive for lapping cemented carbide wire drawing dies.

Improved disc wheels for various types of surface grinding.

Controlled Structure for better duplication of grinding action.

Foundry wheels, billet grinding wheels, roll grinding wheels, mounted points for die work—improvements have been made in each of these, too—keeping them in step with the developments in metals.

It is this continual research and improvement—this keeping pace with metal development—that has made Norton wheels so popular in the metal working industries.

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NORTON ABRASIVES

BLACK & DECKER

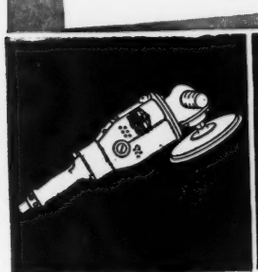
World's Largest Manufacturer BLACK & DECKER **of Portable Electric Tools**

This Grinder pays its way in Increased Shop Efficiency

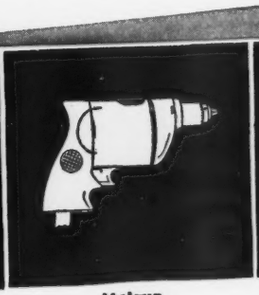
THERE'S nothing more convenient than one or more Black & Decker Bench Grinders spotted in strategic plant locations. For the ability to sharpen tools, wire brush and perform other tasks right on the job speeds up regular shop operations—enables men to work easier and more efficiently.

The 8" Bench Grinder illustrated soon pays for itself in tool sharpening, grinding, wire-brushing, burnishing, polishing, buffing and many other jobs. An extended spindle and tapered housing give ample space around wheels and permit easy operations on large castings, etc. A full ½-H.P. motor provides abundant power for heavy-duty service—wheel guards comply with all safety regulations, being fully enclosed and equipped with tool rests and spark shields. Also drilled and tapped for eye shields which are supplied at small extra cost.

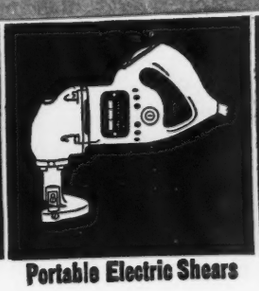
There are 4 Bench Grinders in the Black & Decker line. Ask your Jobber to suggest the one best suited to your needs—or write for details. The Black & Decker Mfg. Co., 719 Pennsylvania Avenue, Towson, Maryland.



Portable Electric Sanders

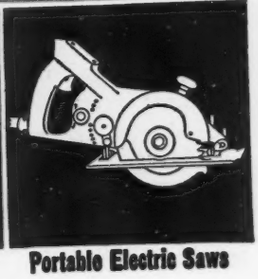


Holgun



Portable Electric Shears

Utility Power Drills



Portable Electric Saws

IT'S A *Lightning Fast* JOB—

When You Build Your Factory Roof with

● Made up of individual plates 18" wide and any length necessary to span the distance between purlins, the Wheeling Tri-Rib Steel Roof Deck can be quickly and easily applied. The plates are attached to the purlins and to each other by clips or welding. Pre-fabricated to the right dimensions for the job, they require no cutting or fitting. Their overlapping ends never have to be forced in place. All of the assembly work is handled from the top of the deck. No scaffolding required. The flat, smooth surface is ready to receive insulation and roofing as soon as the assembly is completed. Made of COP-R-LOY —Wheeling's famous rust-resisting copper alloy painted or galvanized, the Wheeling Tri-Rib Steel Roof Deck assures dependable service at lowest maintenance costs. Catalog on request. Address the nearest office listed below.

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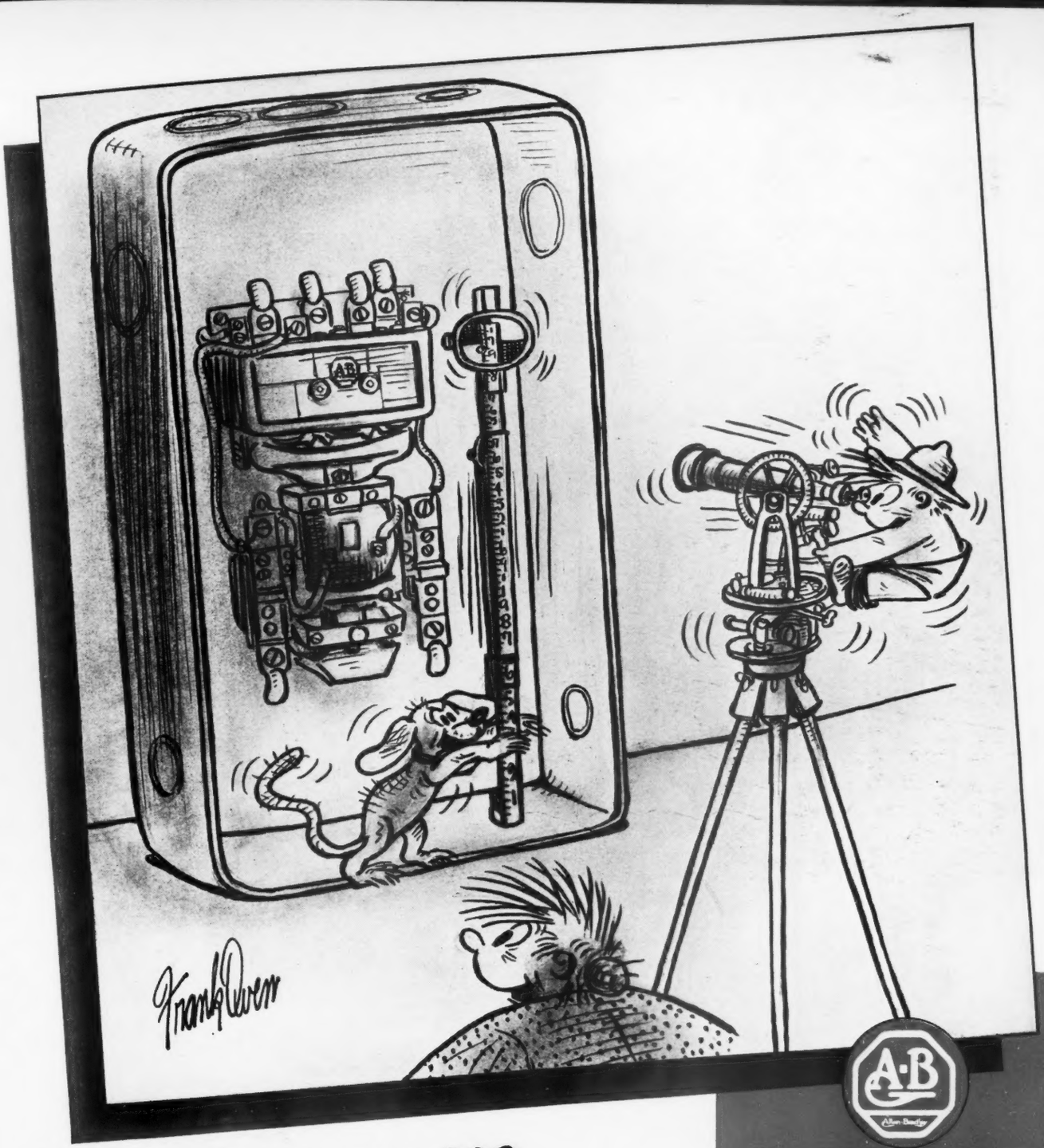
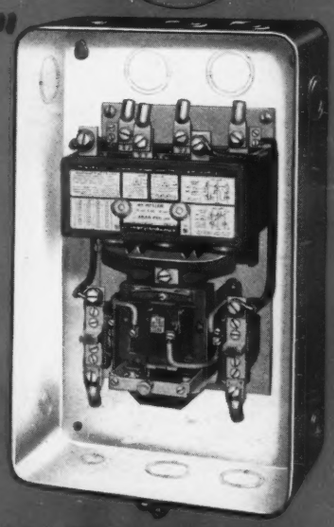


"Sure, Mama can see there's lots of room in that starter!"

You'll find plenty of room for wiring in this Allen-Bradley solenoid starter—room to do a neat job. And the white interior helps you do the job quickly. Yet, the over-all dimensions of the Allen-Bradley solenoid starter are smaller than those of any other starter of equal rating. The reason for this is its compact solenoid mechanism. And, once installed, this Allen-Bradley solenoid starter requires little attention. The double break, silver alloy contacts never need cleaning or filing. They last many times longer than ordinary copper contacts. Specify Allen-Bradley solenoid starters on your next job. You will save time and money on every installation—save trouble in service.

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL



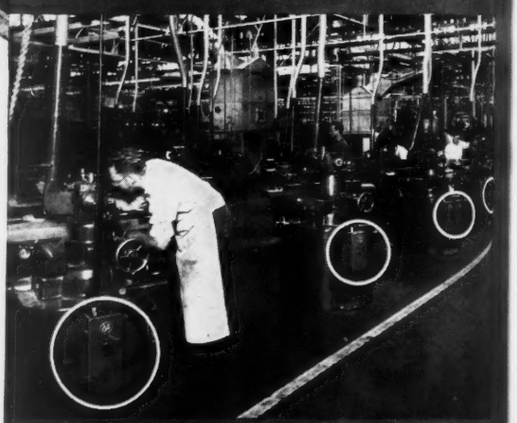
Bulletin 709. Note the simple construction. Terminals are exposed for easy wiring.

One hundred electric test-stands for breaking in engines in a large automobile plant. Note the neat appearance of these Bulletin 712 combination starters.

Simplify Your Motor Control Installations this *Easy* Way!

ALLEN-BRADLEY combination starters combine the inherent reliability of the solenoid switch with a disconnect switch of unique design that has the same high current interrupting capacity as the automatic starter. Conduit and wiring connections are greatly simplified—installation cost is reduced. Less mounting space is required than with separate starter and disconnect switch. In addition, the appearance of the installation is greatly improved. The disconnect switch lever is operated from the front of the cabinet. This convenient operating arrangement also permits close grouping of starters. Allen-Bradley combination starters can be furnished with a circuit breaker in place of the disconnect switch.

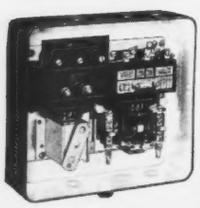
Allen-Bradley solenoid starters are available for across-the-line, reversing, multi-speed, reduced-voltage, and other types of service. Investigate the Allen-Bradley line—it offers you every advantage.



Eighteen cutter grinders in automotive tool room equipped with Bulletin 712 combination starters.

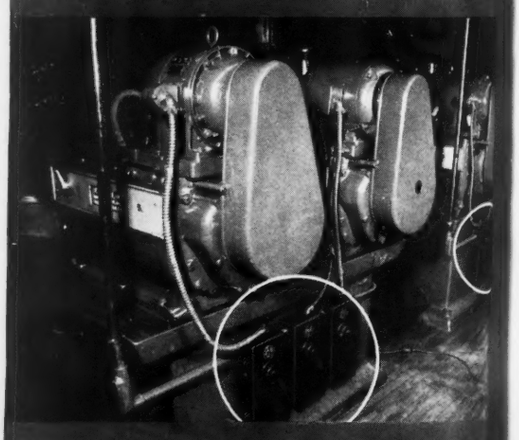
BULLETIN 712 COMBINATION STARTERS OFFER THESE FOUR BENEFITS

Small Size
Generous Wiring Room
Trouble-Free Operation
Attractive Appearance



Bulletin 712 Size 2
Horizontal Type

Bulletin 712 Size 1
Vertical Type



Gear-facing machines equipped with Bulletin 712 combination starters. Front lever operation permits close grouping of the starters and saves space.

Send for Bulletin 712

Allen-Bradley Co.
1321 S. First St.
Milwaukee, Wis.

Please send copy of Bulletin 712.

Name .....

Company .....

Address .....

City ..... State .....

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

HACK SAW SHRAPNEL IS OUT-OF-DATE

ZING! Splinters fly as another hack saw blade "explodes". Men shield their faces. One fine workman is perhaps too busy at his nearby bench to notice. He goes to the hospital with the possible loss of an eye. The Safety Engineer has a new headache. Time and money are thrown away.

The tension of a hack saw blade, normally high in a properly adjusted frame, jumps to fantastic heights under a breaking strain. Small wonder that fragments fly as if from a bursting shell. These jagged, glass-hard bits of steel threaten the eyesight of every person within a circle, determined by safety engineers to be as large as 19 feet in diameter.

IT'S A NEEDLESS DANGER

This hazard has been taken right out of the industrial picture by Flexible REZISTOR, the safe high speed steel hack saw blade.

All of this new blade is made of Special Alloy high speed steel, but only the cutting edge is hardened. The body of the blade remains in its annealed condition, serving as an elastic support for the teeth in even the hardest service. Flexible REZISTOR is a totally new idea in high speed steel, now perfected and offered to industry after years of research.

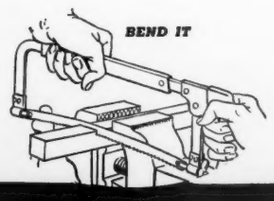
Your production department will welcome this new flexible, abuse-proof blade, for it delivers new economy in high speed cutting. *And does it safely.*

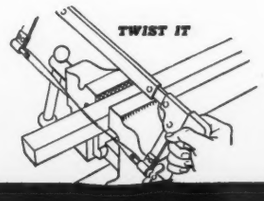
THE HENRY G. THOMPSON & SON CO.

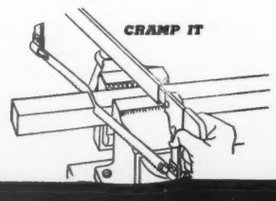
NEW HAVEN . . . CONN.

The FLEXIBLE REZISTOR blade

is made in 8", 10" and 12" hand frame sizes and all standard power sizes.







IT CANNOT BREAK OR SHATTER IN A FRAME

"$84.00 A MONTH SAVING IN STEAM ALONE"...

..."NOW USING 2 SHIFTS INSTEAD OF 3

..."SAVES US

How much would Bristol's instruments save you?

There is an interesting thing about the dollars and cents savings which Bristol's instruments in so many instances are making possible. This is the fact that such savings usually are a secondary benefit—often unexpected although always acceptable—following the application of a Bristol's recorder or controller. Money savings as such are seldom if ever the primary objective for which Bristol's instruments are originally installed.

A case in point is a mill in Pennsylvania. This plant recently put in Bristol's System of Coordinated Process Control, primarily to control dyeing, that is, to obtain a uniform color that could be duplicated for the same dye formula.

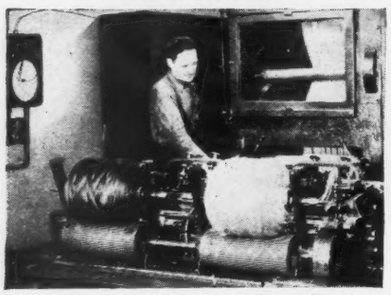
This is being successfully secured. But at the same time the company now finds it is making surprising savings in steam, water, dye, and time.

And so it goes. The following paragraphs briefly describe the savings secured by recent Bristol's installations, all of them selected at random. Similar savings are reported in tens of hundreds of other plants, in every industry, throughout the country.

If you have any particular problem in mind, our engineers will be glad to consult with you. Their recommendations will involve no obligation. Write.

THE BRISTOL COMPANY
WATERBURY, CONNECTICUT
Branch Offices: Akron, Birmingham, Boston, Chicago, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco, Seattle. Canada: The Bristol Company of Canada, Limited, Toronto, Ontario. England: Bristol's Instrument Company, Limited, London, N.W. 10.

$84.00 MONTHLY STEAM SAVING



Here, a Bristol's Controller automatically regulates dryer temperature in a large Canadian carpet mill.

In this mill it is necessary to protect the quality of the wool used in making the finished product. Formerly, excessive heating in the dryer often caused temperatures to soar to the danger point, with the result that product quality was impaired.

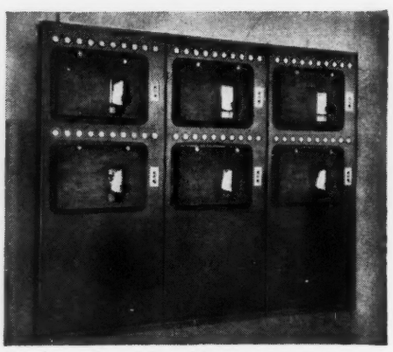
Now, since the process is Bristol's controlled, the improvement in wool quality is amazing. On top of that, the saving in steam alone is $84.00 a month.

HEAVY TELEPHONE TOLL CHARGES NOW ELIMINATED

A west coast utility relies on Bristol's Metameter System of Telemetering for controlling pipe line pressure 8 miles away

Before Bristol's Metameter System of Telemetering was installed by a large west coast utility, numerous telephone calls all day long and throughout the night had to be made continually to see how the gas line pressure at remote points was changing. Now, with a Bristol's Metameter System of Telemetering on the job all these costly long distance calls are unnecessary. Bristol's Metameter Receiver furnishes a continuous uninterrupted record of the line pressure and its fluctuations miles away.

SCOURING TIME CUT 40%



Bristol's Coordinated Control System for regulating scouring machine operation.

That is what one mill reports as a result of using Bristol's Coordinated Control System in its piece goods scouring department.

On top of this the saving in water is over 50%, with corresponding economies in water softening and heating.

BRISTOL'S . . . INDUSTRY'S COMPLETE LINE OF RECORDING,

TRADE MARK REG. U.S. PAT. OFF.

—YET OUTPUT 50% GREATER"...

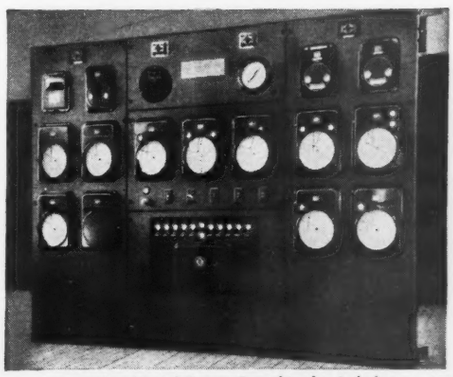
NUMEROUS TELEPHONE TOLL CHARGES"...

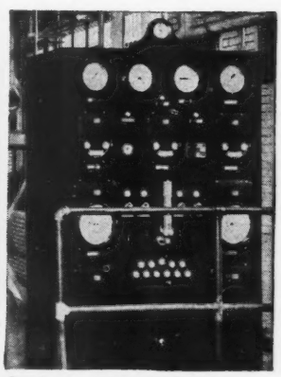
SHORTENS TIME OF PROCESS FROM ABOUT 10 DAYS TO LESS THAN ½ HOUR!

That is what one plant tells us with regard to its installation of Bristol's System of Coordinated Process Control. Another reports: "Secure absolutely uniform product". Still others say: "With our plant operating at its rated capacity, the net profit will be sufficient to pay for the complete Bristol's installation in considerably less than one year".

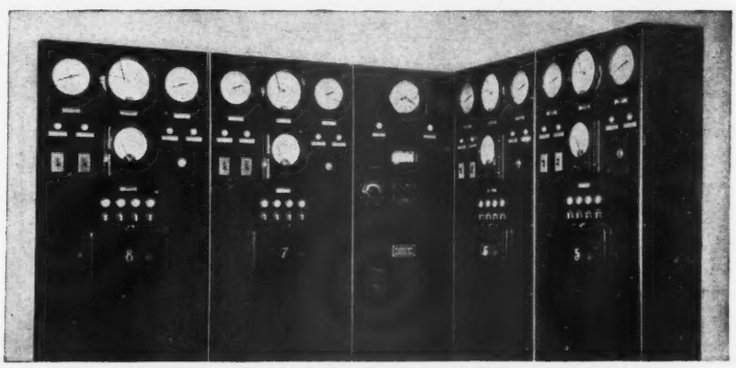
And so it goes. One plant after another is reporting greater production, lower costs, time saved, or other economies which *now, for the first time,* Bristol's System of Coordinated Process Control is making possible.

The results are admittedly startling!





LEFT: *Coordinated Process Control in chemical plant.* RIGHT: *Serving a vacuum retort process.*



Here Coordinated Process Control makes possible maximum yield from an extraction process.

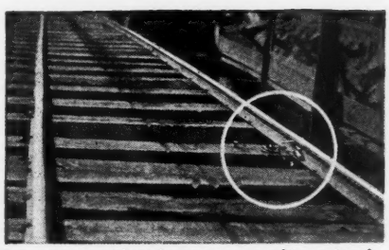
Write for these helpful Bulletins

460F Coordinated Process Control
507F Pyromaster Potentiometer Pyrometer
515F Metameter System of Telemetering
996F Air Conditioning Instruments
510F Machine Operation Recorders
999F Process Cycle Controllers
488F Millivoltmeter Pyrometers
436F Electric Recorders
462F Furnace, Kiln and Oven Temperature Controllers
473F Recording Tachometers
483F Low Range Draft and Pressure Gauges

Catalogs

1050F Recording and Controlling Flow Meters
1014F Recording and Controlling Pressure Gauges
1452F Wide Strip Potentiometer Pyrometers
1250F Recording and Controlling Thermometers

CAR DUMP RECORD GIVES CHECK ON QUARRY OPERATION



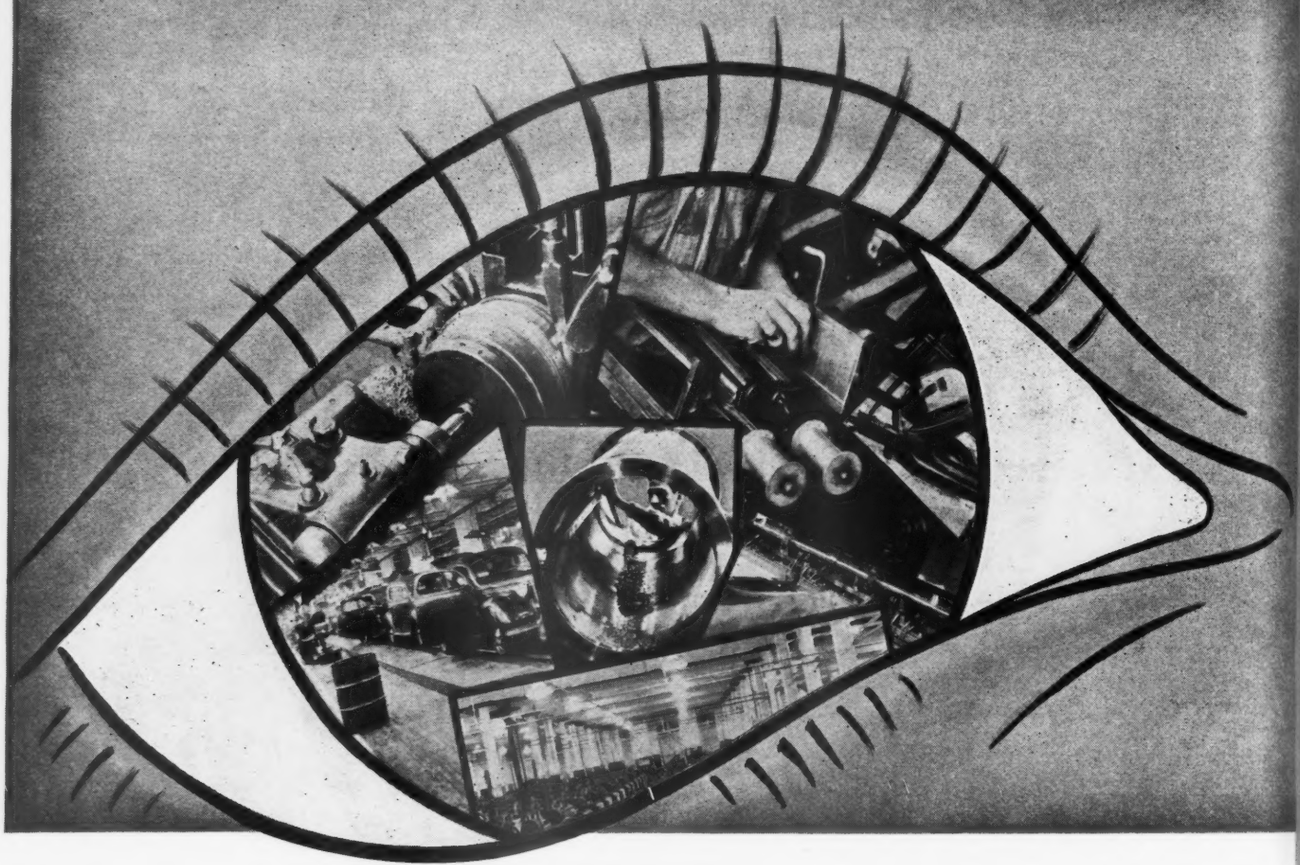
Every time a rock-loaded car passes over this track to the dump, it operates a switch that causes a record to be made on Bristol's Time Recorder in the superintendent's office.

How many pit cars is the quarry producing each hour? What delays are experienced by cars going to the crushers? These are questions that continually confront the superintendent,—and that now are being answered for one southern granite company by a Bristol's Time Recorder used in connection with an ingenious contact switch device on the dump car tracks.

The resulting advantages are a marked improvement in plant efficiency and fewer delays.

INDICATING AND CONTROLLING **INSTRUMENTS**

...CUT COSTS

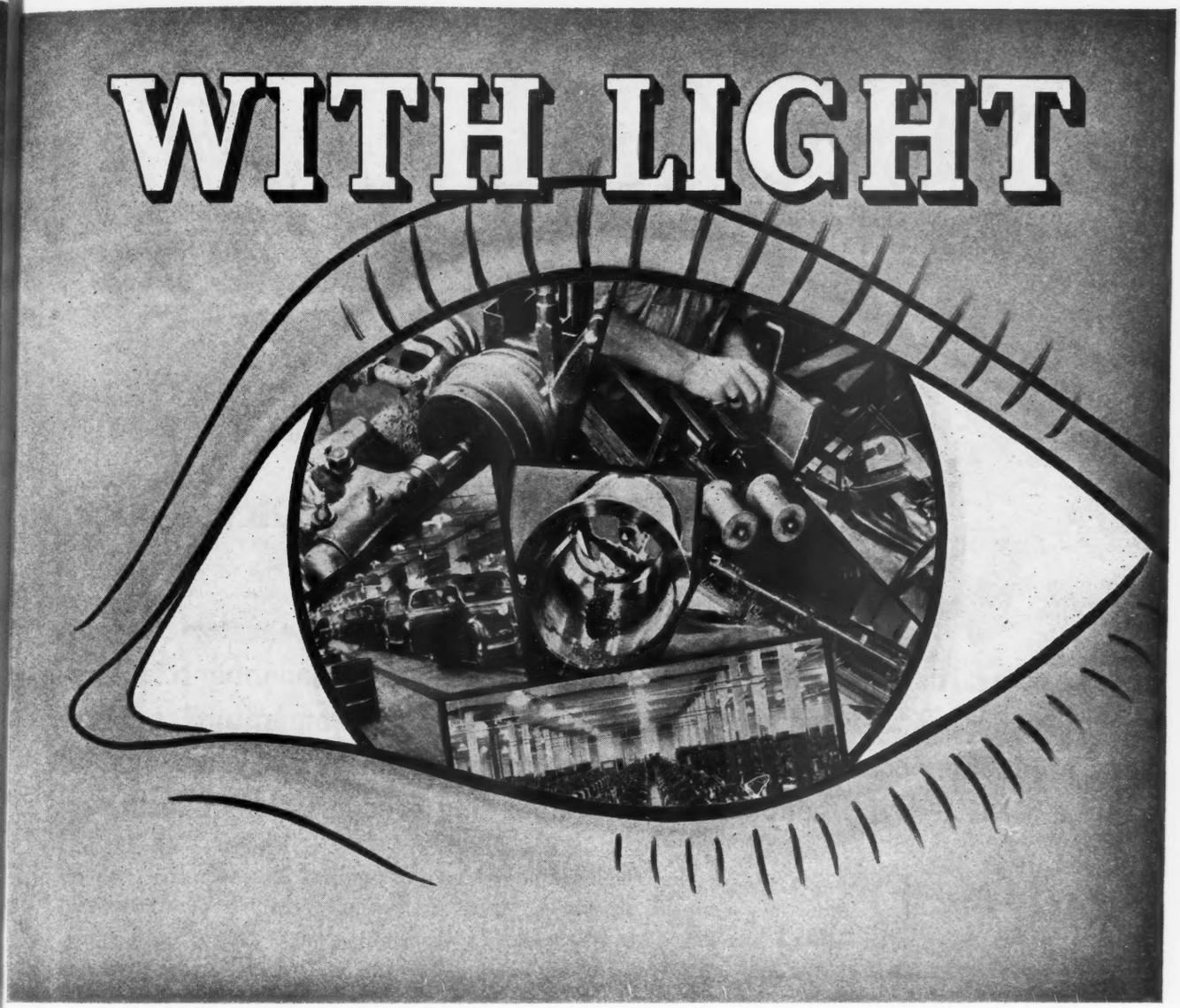


One quick way to stimulate profits from all departments

First, as a means of cutting costs, comes good lighting—lighting that is "engineered to fit the job." It assures quick returns . . . and the profits are continuous. Modern industrial executives are buying light as a production "tool"—a unique "tool" in that it directly affects the efficiency of every worker and every machine. It goes beyond "productive efficiency" by protecting human welfare both while at work and after

GENERAL ELECTRIC

WITH LIGHT



the day's work is done. » » » Good lighting conquers visual strain . . . it makes work safer, more efficient . . . it ends the nervous tension that comes from eye fatigue. Costly waste of dark shadows and glaring highlights has been engineered out of industry —with mercury lighting. » » » General Electric Mercury Lighting, engineered by lighting specialists to the seeing tasks involved, has made it possible to provide sight saving lighting at a cost well justified in industrial gains alone. If you are interested in one sure way to greater profits, have a General Electric lighting specialist survey your plant. Saving customer costs with "engineered lighting" is his primary approach to every lighting job. Drop us a line. General Electric Vapor Lamp Company, 815 Adams Street, Hoboken, New Jersey.

VAPOR LAMP COMPANY

928H

You can

BUT YOUR PRODUCTS AND WHEN TEMPERATURES ARE

There's one problem that hits plants in every industry at some time or other. It's temperature control. Where a mill superintendent or a factory executive has established close, precise regulation of temperature, he has seen production costs drop and has started profits on the way up. And in many a plant today, production heads are puzzling over questions like these:

"DOES MY PLANT have the most modern type of temperature control? Are there important steps in processing where indicating, recording or controlling instruments are lacking? Are temperature leaks robbing me of profits and helping to write losses on my books? Have I replaced all manual regulation of temperature, or temperature guessing, with modern automatic regulation?"

Taylor Engineers can help you answer such questions.

LET'S LOOK AT THE RECORD *The following cases have been picked from Taylor files without attempting to cover every type of plant. Space prevents giving more than a few high lights of the work of Taylor Engineers.*

IN A CANNERY

Taylor Engineers made a survey in a large plant to see where temperature control might save money. Their recommendations and the Taylor Instruments and Systems installed soon after resulted in a saving of 25% in the plant's annual fuel bill, in a reduction of losses from panels, swells, and buckles, and in the safe processing of products in large cans as well as the small sizes.

IN A DAIRY

A New York dairy found that pasteurizer temperature control was not operating satisfactorily. The quality of the milk was affected—the depth of the cream line was not uniform. An antiquated system of regulation was replaced by a modern system of completely automatic Taylor pasteurizer control which maintained the temperature within ½°F. variation without a hand touching it.

IN A PACKING PLANT

A packer in the Middle West installed a Taylor Self-Acting Temperature Controller in his steam-heated smokehouse. After two weeks he ordered a second instrument. Why? Because he had cut 5 hours from the smoking time . . . and kept the color of his meat a uniform red that attracted more

escape—

YOUR PROFITS SUFFER...

TOO HIGH OR TOO LOW!

customers. He saved money and helped to stimulate sales.

IN AN OIL REFINERY

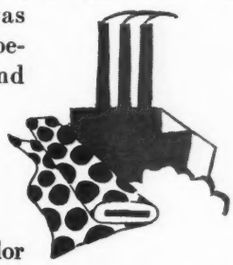
A western refinery decided to install modern, automatic temperature control. Taylor Engineers put in a system with Taylor Dubl-Response Control. *Result:* This automatic control increased the gasoline yield approximately 1% on an average daily run of 4,000 barrels.

IN A PAPER MILL

A large paper mill ran a several weeks' test comparing the efficiency of manual and automatic control of pulp grinders. A Taylor System of Automatic Grinder Temperature Control proved that it could help to increase production 8.9%, reduce conversion costs, and give more uniform quality pulp than before.

IN A TEXTILE MILL

A northern cotton mill wanted to install a more complete system of temperature control. After a survey, Taylor Engineers said, "If you spend $8,000 on control, you will save around $35,000 a year." A Taylor System of Slasher Control was put in. It saved between $33,000 and $35,000 a year.



ANOTHER COTTON MILL

spent $4,000 on Taylor Temperature Control in the Slasher and saved $11,000 in 48 weeks' time. Savings resulted from 70 tons less coal, less raw material, and lower per pound cost of cloth through a 1% production increase.

IN YOUR OWN PLANT

No matter what you produce . . . let Taylor Engineers work with you to relate a Taylor Control System to your needs. We have emphasized temperature regulation in the foregoing cases. But do not overlook the fact that, if there is a question of temperature, pressure, liquid level, rate of flow, or humidity, Taylor can advise you on the system to meet your requirements. For engineering advice and help, see a Taylor Representative or send the coupon direct to Taylor Instrument Companies, Rochester, N. Y. Plant also in Toronto, Canada. Manufacturers in Great Britain—Short & Mason, Ltd., London, England.

THIS PARAGRAPH MAY HELP YOU SAVE MONEY

If there is the slightest doubt in your mind about the efficiency or completeness of the temperature control in your plant now, turn that doubt into action. Fill out the coupon below, tear out this corner of the page, attach it to your company letterhead and mail it today. A request for information about Taylor Control costs you only a 3c stamp. It may result in great benefit to you. There are quick ways to profit through Taylor Temperature Control.

Taylor

Indicating Recording • Controlling

TEMPERATURE, PRESSURE, FLOW *and* LEVEL INSTRUMENTS

Taylor Instrument Companies, Rochester, N. Y.

I am interested in finding out how my plant can benefit from further application of temperature control.

☐ Send me data on your temperature instruments.

☐ Have a Taylor man call.

(check one or both)

Name_____ Position_____

(Please attach to your company letterhead)

IN THESE MODERN DAYS=

—old-fashioned methods of floor maintenance are fast becoming a thing of the past. Mopping is messy and ineffectual—it lacks the pressure needed to remove dirt. Occasional hand scrubbing means uneven results. Oil is insanitary and drab looking. These methods allow floors to become worn and dingy. Moreover, they take far too much time—time for which you must pay.

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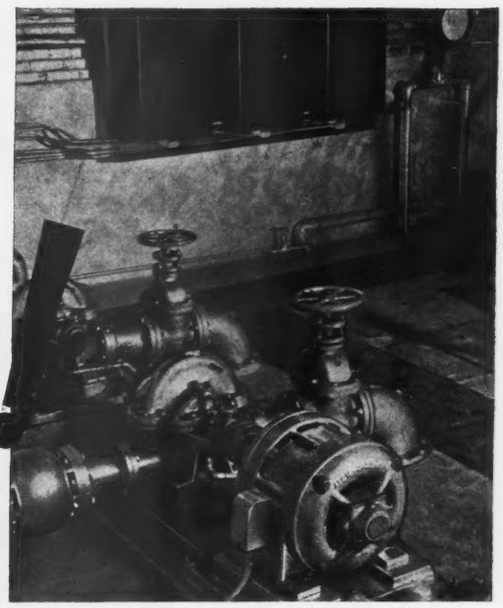

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Reg. U. S. Pat. Off. and Foreign Countries

BY THE MAKERS OF SCOTTISSUE, WALDORF AND SCOTTOWELS FOR HOMES

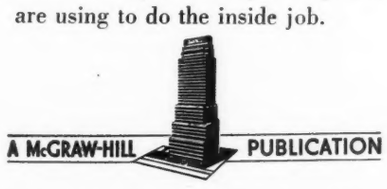
Contents

Factory
Management and Maintenance

NOVEMBER, 1938

Public Relations
INDUSTRY'S BIGGEST JOB

PUBLIC RELATIONS breaks down into an outside and an inside job. The one is industry's relationships with customers and communities; the other, its relationships with employees. All this *Factory* pointed out, in October, in a special presentation emphasizing the need to do the inside (industrial relations) job well before tackling the outside (public relations) job. In December *Factory* will again emphasize this point in a special section that describes not only an outstanding public relations job done by an entire industrial community, but also some of the industrial relations techniques that specific plants are using to do the inside job.



Index 52

500 Quick Ways to Profits 57

How to Use This Issue 58

1. Materials Handling, Layout, and Motion Economy 59
ITEMS 1–42 60–64
ITEMS 415–425 126–128

2. Power and Light 65
ITEMS 43–99 66–72
ITEMS 426–431 128–132

3. Mechanical Power Drives 73
ITEMS 100–143 74–78
ITEMS 432–448 132–136

4. Heating, Ventilating, and Air Conditioning 79
ITEMS 144–196 80–85
ITEMS 449–452 136–140

Winners of the Factory Awards 86
ITEMS 197–231 88–98
ITEMS 453–471 140–172

5. Buildings and Services 99
ITEMS 232–274 100–104
ITEMS 472–488 172–182

6. Production Planning and Control 105
ITEMS 275–311 106–110
ITEMS 489–500 182–188

7. Public and Employee Relations 111
ITEMS 312–353 112–116

8. Production Methods and Materials 117
ITEMS 354–414 118–124

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INDEX

1. Materials Handling, Layout, and Motion Economy

BUNDLING, CRATING, PACKING

3 New Layout Eliminates All Needless Walking 60
19 Container Costs $1.28 Less..... 62
27 Ships a Unit for 58c Less..... 63
31 Packing Costs Down $4,900..... 63
417 Cuts Loading Costs 80%..... 126
420 $10,000 Saved in Materials and Labor 126
421 Machine Packing Saves Them $6,000 a Year..... 128

CONVEYORS, BELT

16 Manufacturing Interval Was Downed 87% 61
32 Conveyed to Save a Handling.. 63
423 No Wasteful Rehandling Here.. 128

CONVEYORS, CHAIN

20 34 Months to Break a Link..... 62
25 They Ride the Conveyor and Save $97.84 a Day... 62
210 Cuts Plating Costs 40%..... 92

CONVEYORS, GRAVITY ROLLER

26 Now 4 Men Run 9 Machines.... 63
36 Four Men Do as Much as Ten.. 64
419 Faster and Surer Weighs..... 126
423 No Wasteful Rehandling Here... 128

CONVEYORS, PORTABLE

458 Ups Bags per Hour 30%..... 148
459 Loading Time Down 62½%..... 150

CRANES

6 Returns Cost the First Year..... 60
11 Saves 25% in Cut-Off Costs... 61
17 Two Men Do Gang's Work... 62
18 Jib Crane a Money Saver..... 62
42 $13,000 Saved in 178 Days..... 64

HOISTS

17 Two Men Do Gang's Work..... 62
26 Now 4 Men Run 9 Machines.... 63
36 Four Men Do as Much as Ten. 64
415 Charge Cupola for $1,260 Less.. 126

LAYOUT

3 New Layout Eliminates All Needless Walking 60
7 Process Time Is Cut from Six Days to Four 60
10 From 59 Steps to 22..... 61
11 Saves 25% in Cut-Off Costs... 61
16 Manufacturing Interval Was Downed 87% 61
26 Now 4 Men Run 9 Machines.... 63
34 Flow Methods Assure Quick Deliveries 63
35 20% More Capacity with New Layout 64
36 Four Men Do as Much as Ten... 64
40 Built a Balcony for Storage.... 64
197 Down Went Costs..... 88
215 Helps You Change Layout..... 94

LOADERS

4 Cars Loaded in Less Time..... 60
422 Loading Cut from $4 to $2..... 128

MONORAILS

1 One Man and Monorail Keep Materials Always at Hand..... 60
25 They Ride the Conveyor and Save $97.84 a Day..... 62
37 $1,428 from Die Handling..... 64
416 Saved 10c on the Handling Dollar 126

MOTION ECONOMY

5 Speeds Up Portable Wrench.... 60
8 Test Panel Saves Time..... 60
10 From 59 Steps to 22..... 61
12 She Slides as She Works..... 61
13 No Helper Now, 40% Saving.. 61
15 One Fixture, Five Gages..... 61
21 Easier, Quicker, Safer Drilling... 62
23 Speeds Up Small Assemblies... 62
24 More Production by Half..... 62
26 Now 4 Men Run 9 Machines.... 63
28 87% Increase on Small Assemblies 63
418 Two-Hand Inspection 126

425 Stock Never Overheats on This Steam Table 128
204 1 Man for 4, More Work..... 90
213 Walking Out, $1,436 Saved.... 93
227 Winds 6 Spools at a Time..... 97
228 Tray Pre-Positions Parts..... 97

SAND-HANDLING SYSTEMS

424 Upped Output 40%..... 128

SCALES

419 Faster and Surer Weighs..... 126

TOTE BOXES AND RECEPTACLES

38 Crushed Turnings Cost Less to Handle 64
39 Saved $10,000 on Assembly.... 64
219 Skid Box with Door..... 95
228 Tray Pre-Positions Parts..... 97

TRACTORS, LOCOMOTIVES, ELEVATORS

9 Handles at a $6,364 Saving.... 61
33 8 Hours' Fuel Costs 50c..... 63
38 Crushed Turnings Cost Less to Handle 64
209 Elevator Saves $2,000..... 91

TRUCKS, POWER

2 Trucks Save $113.50 a Day..... 60
14 Reduced Idle Press Time..... 61
22 Saves $7,000 on Freight..... 62
29 Loading Cost Cut from 49c to 24c a Ton 63
30 Doubles Truck's Capacity..... 63
38 Crushed Turnings Cost Less to Handle 64
41 13,200 Miles Saved Yearly..... 64
198 Shop Work Cost Cut $12,000... 88
224 Truck with Two Good Tricks..... 96

TRUCKS, FLOOR

216 No Slopping with This Truck.... 94
217 Tote Trays on Wheels..... 94
231 Barrel Truck Saves Backs..... 98
461 Eliminates Three Handlings..... 150

2. Power and Light

CONTROL, COMBUSTION

67 Coal Bills $5,000 Smaller..... 68
200 11% More Boiler Capacity..... 89

CONTROLS, ELECTRICAL

47 Merely Replace Pushbuttons.... 66
49 Check Voltage First..... 66
55 Eliminates Costly Delays..... 67
60 Separate Control Rooms, No Fire Hazard 68
65 So Motors Can't Flood..... 68
68 Photocells Prevent Jams..... 69
83 Stops Unexpected Starts..... 70
88 Thin Shim Stops Sticking..... 71
89 Conveyors Can't Go Wrong.... 71
90 Interlocking Stops Damage..... 71

DEMAND REDUCTION

70 Staggers Load, Cuts Demand... 69
72 Demand Charge Down $66..... 69
430 Leveled the Peaks and Cut Demand 64% 130

DISTRIBUTION AND WIRING

48 Power Tools on Own Circuit.... 66
66 Watch Ground Connections.... 68
75 $1,000 Wiring Job Pays Out in 9 Months 69
77 Clean Fuse Clips Pay..... 70
82 Lamp Shows Up Open Breaker.. 70
84 Check Circuit Breaker Interrupting Capacity 71
91 Prevents Motor Failures..... 71
98 New Wiring Reduces Losses $100 a Month 72
202 Stops Production Jams, So Saves $1,000 a Year..... 89
427 Localizing Motor Troubles..... 130

INSTRUMENTS, ELECTRICAL

51 Power Bills Shrink $2,399..... 66
62 Wasn't the Motor's Fault..... 68
63 Irons Power Peaks to Save $200 a Month 68
76 Meter Your Motors..... 70

78 Overtime Output up 50%..... 70
431 25% Easier on the Power..... 130

LIGHTING

50 Better Light, Fewer Errors..... 66
54 Photocell Light Control..... 67
57 No More Juice, But Much More Light 67
61 Increases Production 35%..... 68
64 Pays $5,400 to Douse Lights..... 68
79 Best to Burn Your Lamps at Rated Voltage 70
80 More Light, Fewer Headaches.. 70
97 Gloom Gone, Accidents Also... 72
426 Less Current, More Light..... 128

METERS, BOILER

74 Boiler Meters Pay 391%..... 69
86 Meters Pay Out in 5 Months.... 71

MOTORS

45 Prevents Motor Breakdowns..... 66

58 Ran Two Years, Still O. K..... 67
73 Cure: Splash-Proof Motors..... 69
96 Right Motors Save Money..... 72

POWER FACTOR CORRECTION
(By Capacitors)

52 Capacitors Pay 50% a Year..... 67
85 Returned Cost First Year..... 71
87 Saved $2,000 in 4 Months..... 71
92 High P. F. Saves $1,400..... 71
93 Electric Bills Down $200..... 72
99 Get the Most Out of P. F. Correction 72

POWER FACTOR CORRECTION
(By Synchronous Motors)

44 $240 a Month from Power..... 66
46 Pays No More Penalties for Low Power Factor 66
71 Upped Power Factor to 93%... 69
199 Improved Power Factor Pays $11,000 89

POWER SUPPLY

95 Buys Power, Saves $2,500..... 72
428 Off-Peak Power Saves $6,500... 130

PULVERIZED FUEL

43 Saves 35 Tons of Coal a Day... 66

STOKERS

53 Ups Steam Production 11%..... 67
56 Stokers Save $3,140 a Year..... 67
81 More Steam with Less Coal..... 70
94 Burns Cheaper Coal, Saves $180. 72
429 Stoker Earns $1,500 a Year..... 130

TRANSFORMERS

59 Why Modern Transformers..... 67
69 Saved Transformer Losses..... 69

3. Mechanical Power Drives

No. *Page*

BEARINGS, ANTI-FRICTION

103 Saves on Motor Maintenance.... 74
434 Earn a 45% Return..... 132
444 Jumped Capacity by Half..... 136
470 One Packing Outlives Four..... 170

BEARINGS, SELF-LUBRICATING

435 Cuts Maintenance Cost..... 132

BELT DRIVES

112 Belt Life Upped 3 Times..... 75
114 Drives Fan Troubles Away..... 75
115 Avoids Costly Change-over..... 75
120 Comb Removes Belt Static..... 76
128 Now Automatic Tension..... 77
130 Smooths Out Belt Impulses..... 77
134 Cured a Flapping Belt..... 78
137 Heavy Pulley, Steady Load..... 78
432 For Longer Belt Life..... 132
436 Keep Pulley Diameters Large.... 132
443 For Tight Vertical Belts..... 134
447 Better Belt, Half the Cost..... 136

BELT-TENSIONING MOTOR BASES

128 Now Automatic Tension..... 77
134 Cured a Flapping Belt..... 78
443 For Tight Vertical Belts..... 134

CHAIN DRIVES

129 Called for a Chain Drive..... 77
139 Don't Let That Chain Jump..... 78
141 Only an Inch Out, But—..... 78
143 Silent Chain Answered..... 78

No. *Page*

CLUTCHES AND COUPLINGS

106 Clutch Saves 60 Horse..... 74
122 Saves Cost of New Motor..... 76
131 One Coupling Not Enough..... 77
437 Load Down, Power Factor Up... 132
445 Limit That Misalignment..... 136

LINESHAFT DRIVES

104 Changed to an Alloy Shaft..... 74
116 Those Little Drops of Oil..... 76
117 Under-the-Floor Drives Pay..... 76
127 Watch Shaft Alignment..... 77
135 After Cutting Keyseats..... 78
140 Small Groups More Flexible..... 78
142 Locate Hangers Right..... 78
433 A Split Lineshaft the Cure..... 132
441 Drives in Trenches Easy to Maintain 134
446 Both Unit and Group Drives.... 136

LUBRICANTS

102 Never a Burned-Out Bearing.... 74
107 This the Place for Grease..... 74
123 A Grease a Week's Enough..... 77
438 Right Lubricant Saves $268.... 134
442 Comb Box Chatter Removed.... 134

LUBRICATING DEVICES

101 Grease Guns Saved $375..... 74
105 Eliminated Bearing Failure..... 74
110 Filler Tank for Grease Gun Saves Time 75
119 19% More Work from Presses... 76
124 Oiling Costs Down $12,000.... 77

No. *Page*

448 Cuts Power Costs $19,000..... 136
455 Oiler Prolongs Saw's Life..... 144

PULLEYS

118 Weld When Keyways Are Worn. 76
130 Smooths Out Belt Impulses..... 77
137 Heavy Pulley, Steady Load..... 78
436 Keep Pulley Diameters Large... 132

SPEED REDUCERS AND GEAR MOTORS

109 Cuts 25 Hp. Down to 10..... 75
125 Just Enough Space..... 77
132 $4,590 Less for Power..... 77
136 Saves $270 an Hour With Speed Reducers 78
439 Air Out Stops Oil Leakage..... 134
457 Progressive Rinsing Saves Manual Handling 146

UNIT DRIVES

446 Both Unit and Group Drives... 136

VARIABLE-SPEED TRANSMISSIONS

100 Many Speeds for Conveyor..... 74
108 Cut Out One Cut..... 74
111 Varied the Speed to Save..... 75
113 Ups Its Output 20%..... 75
121 20 to 30% Power Savings..... 76
126 $1,400 Less Waste a Month..... 77
133 Maintains Any Frequency..... 77
138 Variable Speeds Pay Out..... 78

VIBRATION DAMPING

440 Damped Machine Vibration..... 134

4. Heating, Ventilating, and Air Conditioning

No. *Page*

AIR CONDITIONING

144 Fast Cooled, Faster Packed..... 80
150 More Rigid Inspection..... 80
151 Keeps Attendance at 99%..... 80
153 Pays Out Many Times..... 81
156 Canada or Panama, to Order... 81
159 Now Year-Round Operation Is Possible 81
160 Fewer Colds by 46%..... 81
164 Better Product Now, So No More Costly Returns 82
166 Reclaims Two Basements..... 82
167 Smooths Out the Peaks..... 82
171 Easier to Meet Schedules..... 83
172 Weather's Always Right..... 83
173 Cuts Absenteeism 56%..... 83
180 Air-Conditioned Tests..... 84
182 Lost Time Down 87%..... 84
183 For Mushrooms, Too..... 84
184 Saves 2 Men's Work, $2,000.... 84
186 Insures Uniform Product..... 84

No. *Page*

187 Ups Its Profits 20%..... 84
190 No Specks to Spoil..... 85
192 Betters Plant and Product..... 85
193 Ups Quality, Cuts Rejects..... 85
452 Doubles Rate of Production.... 140

CONTROL, AUTOMATIC

177 Automatic Controls for Best Results 83
194 Thermostats Can Save Heat.... 85

DUST REMOVAL

148 Removes 98% of Fine Dust..... 80
158 Pipe Out, More Room In..... 81
178 Long Dust Hoods Economical... 83
185 Filtered Air Makes Saving..... 84
195 Pressure Keeps Dust Out..... 85
450 Pick Money Out of the Air.... 140

FANS AND BLOWERS

146 Stops Summer Slumps..... 80

No. *Page*

165 Fans Reclaim Hot Spot..... 82
168 One Fan Does Work of Two.... 82
175 Cool Workers Produce More.... 83

FUME REMOVAL

161 Out Go the Fumes..... 81
174 Fumes Can't Reach the Fan..... 83

HEATING

145 Costs 15% Less for Heat..... 80
155 Costs Less, Always Warm..... 81
162 Unit Heaters Cut Fuel Cost.... 82
163 No More Fog in the Foundry.... 82
176 Easy with Electric Heat..... 83
179 Heat—at No Extra Cost..... 83
181 Electric Heat for Office Is Cheaper by Half..... 84
188 Waste Heat Warms Factory and Saves $17,000..... 85
189 Cuts Coal Bill $800..... 85
196 Heaters Keep Out Cold Air.... 85

449 No More Wintry Blasts..... 140
451 $450 Saved in One Season..... 140

INSTRUMENTS, RECORDING
147 Graphic Records Leave No Doubts 80

INSULATION
170 To Lessen Condensation..... 82
191 Insulation Cuts Heat Loss..... 85

REFRIGERATION
149 Cool Air Helps a Creamery.... 80
154 Product's Always Fresh..... 81

UNIT HEATERS
145 Costs 15% Less for Heat..... 80
162 Unit Heaters Cut Fuel Cost.... 82
163 No More Fog in the Foundry... 82
196 Heaters Keep Out Cold Air.... 85

VENTILATION
152 No Chance for Explosion..... 80
157 Small Fan Dries Basement..... 81
169 Raised Ventilator, Saved More Than $400..... 82

5. Buildings and Services

No. *Page*

CALKING
269 Calking Saves Heat..... 104

CEMENT, QUICK-HARDENING
250 Laid One Day, Used the Next.. 102
272 Presses Kept on Working..... 104
473 Eliminates 10-Day Cure..... 174
485 Foundations Done in a Day..... 178

COATING, PROTECTIVE
243 No Maintenance in 2 Years..... 101

COMMUNICATION AND SIGNALING
254 Saves Telephone Time..... 102
258 It's All Put on the Air..... 103
264 Calls Cranes by Phone..... 103
479 They Work While They Talk.... 176

COMPRESSORS, AIR
233 After-Cooler Cuts Costs..... 100
251 Boosts Plant Efficiency..... 102
253 Meets All Air Demands..... 102
266 Booster Compressor Knocks $691 from Power Bill..... 104
484 Easier on the Air..... 178

CONNECTORS, METAL
472 Metal Connectors Save Time.... 172

FIREFIGHTING EQUIPMENT
244 Sprinkler Saves $9,900..... 101
268 Extinguisher Record Pays..... 104

FLOORS AND FLOOR COVERINGS
234 Clean Floors, $1,250 Saved..... 100
241 Floor Cleaner Pays Out in Year. 101
242 Still Good After 10 Years..... 101
250 Laid One Day, Used the Next.. 102
259 Hardener Improves Floors..... 103
267 Hardened Concrete Lasts..... 104
272 Presses Kept on Working..... 104
475 Steel Plates Cut Wear..... 174
481 Non-Skid, Non-Leak..... 178
482 No Wear After 3 Years..... 178
488 Not a Slip in a Shower..... 182

GLASS
236 Felt Stops Glass Breakage..... 100
483 Reduces Glare from Windows... 178

HEATING, PROCESS
232 Process Heat Cost Off 31%.... 100
237 Only Half as Much Steam..... 100
240 Steam Serves as Yardstick..... 101
247 New Boiler Saves $10,200..... 101
249 Boiler Meters Save $20,000..... 102
255 Best Use of Process Steam..... 102
263 Steam Booster Saves $70..... 103
271 Water Saves Fuel..... 104

MAINTENANCE SERVICE
229 Map Speeds Maintenance..... 98
248 Tells Where Electrician Is..... 102
471 No Overtime for Maintenance.. 172
480 No Shock with Low Voltage.... 176

PAINTING
261 Whitewash from Waste..... 103
270 Paint Keeps Plant Cooler..... 104
273 Last Half as Long Again..... 104
477 Paints White, Saves Light..... 176
478 Keeps Fire from Spreading..... 176
483 Reduces Glare from Windows... 178

PLANT HOUSEKEEPING
234 Clean Floors, $1,250 Saved..... 100
241 Floor Cleaner Pays Out In Year. 101
261 Whitewash from Waste..... 103
274 Publicity an Aid to Good Housekeeping 104
474 Exposes Bad Housekeeping..... 174
476 Cuts Floor Cleaning Costs..... 174
486 Cleans Brickwork Easily..... 182

PUMPS
252 Needs 13% Less Power..... 102
256 Six New Pumps Save $3,700.... 102
265 More Water, Less Power..... 103

ROOFS
238 Saves Roof Repair Bills..... 100
487 When Not to Patch Roofs..... 182

RUST PREVENTIVE MATERIAL
257 Keeps Out Rust and Slime..... 103

WATER
239 Re-Use of Water Cuts Cost.... 100
260 $1,800 Less for Water..... 103
262 Float Valve Protects..... 103

WATERPROOFING
235 Thin Cement Waterproofs Brick Wall 100

WELDING AND CUTTING
245 Welding Saves Engine Base.... 101
246 Oxygen Lance Saves $8,000..... 101

6. Production Planning and Control

No. *Page*

COST CONTROL
211 Makes Employees Customer Conscious 92
218 Cuts Entries on Cost Cards..... 94
225 No Time Cards..... 97
230 Cost Sheet Helps Set Mark.... 98
296 Costs Little to Know Cost..... 108
302 Going to Make a Profit..... 109
303 Three Ways to Figure Burden... 110

INVENTORY CONTROL
203 Reduced Inventory 25%..... 90
212 20% Less Labor, 50% Less Floor Space 92
214 Closer Inventory Control..... 93
284 Downed Inventory $100,000..... 107
286 Cuts Shipping Costs..... 107
308 Stockroom on Wheels..... 110
499 Controlling 27,000 Items..... 188

PRODUCTION CONTROL
205 Cuts 80% of the Time from Invoice Writing..... 90
220 Increases Capacity 50%..... 95
221 No Needless Copying..... 95
275 Schedules Work for 100 Men... 106
276 Machine Control Helps Meet Delivery Dates..... 106
277 Keeps Mill on Schedule..... 106
288 Three Machines Were Enough...107
289 Two Do Six Clerks' Work..... 107
290 It Schedules Just the Same..... 108
292 More Work, Closer Control..... 108
294 Forelady's a Clerk No More.... 108
298 Conveyor Controls Production... 109
300 Storage at Assembly Line..... 109
310 Line vs. Job Production..... 110
489 Duplicating Saves $2,000..... 182
492 Run on 8 Pieces of Paper..... 184
493 Body Meets Chassis..... 186
495 Their Plans Work Backward..... 186
500 One-Man Control Tells All..... 188

QUALITY CONTROL
207 Packers on Bonus Inspect..... 91
208 Cut Waste and Seconds to 3%.. 91
278 Assures Uniform Paint Jobs..... 106
282 Stocking Up on Quality..... 107
285 90% Saved on Steel Samples... 107
295 They Get the Orders Because... 108
297 Black Background Better..... 109
299 Cut Costs of Rejects..... 109
301 Bench for Better Inspection.... 109
311 Save 10% on Lumber Drying.... 110
456 No-Cost Batch Control..... 144
498 Keeping Good and Bad Apart.. 188

TOOL CONTROL
281 Cuts Tool Breakage 50%..... 106
309 A Place for Every Tool..... 110
491 Tool Handling Down $9,000..... 184

WAGE PAYMENT METHODS
207 Packers on Bonus Inspect..... 91
280 Shipping Room Bonus Adds 20% to Earnings..... 106
287 11 Men Do 19 Men's Work..... 107
304 Run Their Own Businesses..... 110
305 52 Pay Checks a Year..... 110
306 Better Than a Bonus..... 110
307 Checks Every Job 44 Ways..... 110
494 Pay Them What They're Worth. 186

WASTE ELIMINATION
206 Down Goes Cost Because Employees Know..... 91

208 Cut Waste and Seconds to 3%. 91
223 Cuts Solvent Losses 20%..... 96
226 Cuts Waste from 16% to 10... 97
279 5 Places to Look for Spoilage... 106
291 Used to Waste $1,910 a Year... 108
293 Show Them What They Waste.. 108
453 13 Ways to Check Wastes..... 140
454 Drier Saves Steam, Space, and Handling 142
466 They Compete to Stop Waste.. 164
469 Control in the Finishing Room Saves 15%..... 168
490 Waste Reduced by $5,500..... 184
496 5 Places to Look for Waste.... 186
497 Spent $200, Saved $3,395..... 188

7. Public and Employee Relations

No. *Page*

CREDIT UNION
352 Keeps Loan Sharks Away..... 116

EMPLOYEE RELATIONS
201 Jumped Payroll Efficiency..... 89
210 Cuts Plating Costs 40%..... 92
314 So They Asked for Milk..... 112
318 Conditioned for Comfort..... 112
324 Music Hath Charms..... 113
327 If You Must Turn Him Down.... 113
328 The Cafeterias Go Rolling Along 114
329 Parking Out of the Cold..... 114
330 Asks What Jobs They'd Like..... 114
333 4 Questions Before Hiring..... 114
334 Those In-Between Snacks..... 114
337 Out of Foremen's Meetings..... 115
339 They Laughed When He Timed Them 115
342 Replacing the President..... 115
344 Putting the New Employee to Work 115
346 More Work, Less Fatigue..... 116
460 Competition Ups Output..... 150
463 Puts Men's Names on their Machines 154

HOUSING
332 Houses They Can Afford..... 114

LOCKERS, SHOWERS, WASH FOUNTAINS
336 Hang Clothes from the Ceiling.. 115

PUBLIC RELATIONS
312 Accounts for 1¼ Billions..... 112
317 How It Distributes Income..... 112
321 Tells Employees the Facts..... 113
323 Talks About the Business..... 113
325 Asked the Neighbors In..... 113

SAFETY
222 Safety Study Saves $500..... 96
315 Clean Oil, No Infections..... 112
316 Prevents Chemical Burns..... 112
319 Be Safe When You Pour..... 112
331 Safety Begins at the Top..... 114
335 Safe from Breaking Bulbs..... 114
338 Helps Teach First Aid..... 115
343 Held a Safety Sweepstakes..... 115
348 No One Wants the Elephant.... 116
349 Warns of Guy Wires..... 116
350 Teams Against Accidents..... 116
351 Makes It Safe to Handle..... 116
353 No One Can Go In Without Goggles On..... 116

TRAINING
313 Promotes Free Expression..... 112
320 Teaches in a Big Way..... 113
341 To Talk About at Meetings..... 115
347 Men for Tomorrow's Jobs..... 116
464 That High Cost of Training..... 154

8. Production Methods and Materials

No. *Page*

ALLOYS, HARD-SURFACING
379 Last 985 Hours Longer..... 121
404 Adds $1,800 to Net Profit..... 123
410 Ten Times the Life..... 124

ALLOYS, SPECIAL
395 Invests $75, Saves $1,150..... 122

CHARGER, CUPOLA
405 Returns Cost in 10 Months..... 123

CLEANER, BOTTLE
389 Bottles Are Dry Cleaned..... 122

COATING, PROTECTIVE
373 Less Wear, Saves $339..... 120
392 One Way to Stop Corrosion.... 122

CONTAINERS, SHIPPING
358 94 Container Sizes to 49..... 118

CONTROLLER, AIR WEIGHT
398 Controls the Fuel Bill..... 123

CONTROLLER, FURNACE ATMOSPHERE
375 Pays 195% Dividend..... 120

CONTROLLER, TEMPERATURE
371 Better Control Cuts Cost..... 120
383 They Last 5 Times Longer..... 121
407 From 10% to 1% Rejects..... 124

CUTTER, KNIFE
359 Reduces Waste 24.3%..... 118

DRILL
390 Saves Time and Power..... 122

DRILLPRESS, MULTIPLE
409 Multiple Drilling to Fit Varying Needs 124

FABRIC, IMPREGNATED
368 Extends Life from 6 Weeks to 14 Months 119

FILTERS
393 Uses Less Cleaner Now..... 122
397 Costs Less to Operate..... 123
412 No Cinders in His Soap..... 124
414 Now Oil Costs Half..... 124

FURNACE, HEAT-TREATING
378 400% More Output..... 121
385 133% Annual Return..... 121
386 25% Less for Finishing..... 121

GREASE DISPENSER
384 Just Enough Grease..... 121
408 Five Times Faster..... 124

GRINDING WHEELS
467 Trebles Life of Grinding Wheels. 166

HARDENING, FLAME
411 Rejections Down to 2%..... 124

LAUNDERING
365 Laundering Saves $5,400..... 119

OIL, CUTTING
399 Costs Down, $230 to $73..... 123

OIL, RECLAMATION
391 Recovers Twice the Oil..... 122

PAPER, WAXED
357 Stronger Package Costs Less.... 118

PLASTIC, LAMINATED
387 Plastic Rails Stand Heat..... 122

PLASTIC, MOLDED
355 Saves Riveting Expense..... 118
366 It's 3½ Lb. Lighter..... 119

RECORDER, PRODUCTION
364 15% More Production..... 119

REFRACTORY MATERIALS
367 $193 Job Saves $3,312..... 119
380 Fuel Cost Cut 57%..... 121
381 $1,500 Saved Many Times..... 121
400 Triples Output, Less Fuel..... 123

SCREWS, RECESSED
388 Less Chance to Gouge..... 122

SCREWS, SELF-TAPPING
372 100% Faster Assembly..... 120

STAMPING COMPOUND
363 Net Result: 30% Increase..... 119

STEEL
356 Saves $140 a Ton..... 118
360 $5,825 Since Installing..... 118
362 Lowers Costs 86.6%..... 119
374 $990 Return $2,333..... 120
406 $350 per Ton of Steel..... 124
465 Switch to Stainless Steel Saves 4 Operations 164

TIMER, STROBOSCOPIC
402 From Weeks to Minutes..... 123

TIMER, WELDING
361 $300 Timer Saves $2,000..... 118

TOOLS, CEMENTED CARBIDE
413 Pays 6% Every 130 Min..... 124

TOOLS, ELECTRIC, PORTABLE
354 Cuts Shear Time 70%..... 118
369 Speeds Up Production..... 119
370 Removes Brand Marks..... 120
377 20% Time Saving..... 120

WELDING, ELECTRIC ARC
376 Pay Out in 8 Months..... 120
394 Weighs 8,400 Lb. Less..... 122
396 Reduces Weight by Half..... 123
401 Changed Design Saves 56%.... 123
403 Costs Less, Half as Heavy..... 123

WELDING, OXYACETYLENE
382 Cuts Cost of Cutter..... 121

To give you one quick way to profits—

INLAND *Created* LEDLOY

to cut machining costs

"From 11 seconds to 3½ seconds machining time on automatic parts, when we changed to Inland Cold Finished Ledloy — a 68% increase in production. The machine finish with Inland Ledloy is excellent—"

—an Automotive Parts Manufacturer.

"A 45% increase in rate of production using Inland Cold Finished Ledloy 1115 for a part formerly made of SAE-X1315. Results from heat-treatment are completely satisfactory—"

—a Household Utilities Manufacturer.

"$12.50 per ton saving on direct labor cost alone is an attractive economy we couldn't afford to miss. We got it by using Inland Cold Finished Ledloy 1115 on a screw machine job threaded the entire length of the bar. We formerly used SAE-X1112 for this part—"

—a Conveyor Equipment Manufacturer.

These experiences, typical for Ledloy users, indicate the remarkable savings you, too, may expect when you use Ledloy, Inland's great contribution to lower machining costs and prolonged tool life.

Inland Ledloy possesses the same desirable characteristics as any open-hearth steel *plus* greatly increased machinability.

You may get cold finished Ledloy from leading cold drawing concerns, and hot rolled forms from Inland.

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SHEETS STRIP TIN PLATE BARS PLATES FLOOR PLATES STRUCTURALS PILING RAILS TRACK ACCESSORIES REINFORCING BARS

Factory
Management and Maintenance
L. C. MORROW, EDITOR

500 Quick Ways to Profits

FIVE HUNDRED QUICK ways to profits. A name that is different for an issue that is different. Different, not in its fundamental objective, but in its approach.

Industry is always searching for ways to cut costs, because it knows that the cost-cutting way is the best way to profits. And it searches for *big* ways to cut costs. Which is all to the good. The search for big ways must go on—will go on.

But in looking for the big ways, may not industry be overlooking the thousand-and-one *little* ways? While going on with the big, suppose it took a lot of little ways also. Might not the total effect of the little ways make as big a dent in production costs as a single spectacular effort?

As a matter of fact, the bigger job may not get done. It doesn't always get beyond the paper stage. For example, take the plant operating man who sees a way to reduce operating expenses by $50,000 a year. His plan involves a complete revamping of layout, building alterations, a thorough overhaul of handling methods.

To make the saving, the company must lay out a quarter of a million dollars. Profitable? Oh, sure, a clear saving of $50,000 a year after a five-year wait.

But right there's the rub. The board of directors is likely to take a long, fond look at the $250,000 and decide to hang onto it. Especially if business "isn't so good." The plant operating man goes back to his desk to think up another *big* way. The outside engineers and equipment makers go back to their homes. Costs go on.

Contrast an abortive attempt like this with what might be called the mass attack on costs. A hundred men in the plant get to thinking up ways to cut costs. Each man concentrates on his own limited department. A hundred ideas go to work.

No one of them colossal. No one involving prohibitive expenditure. The individual returns comparatively small in dollars, but big in percentages. Add them all together, and they stack up well.

It is to stimulate this mass attack on costs that *Factory* presents these *500 Quick Ways to Profits.* They are cost-cutting ideas that *have* helped some plants to produce profits. They *can* help other plants—sometimes just as they are, sometimes changed to meet different conditions.

THESE 500 IDEAS have been supplied by *Factory* readers, by manufacturers, and by the editors. Many more like them will be found in the advertising pages of this issue. Fifty-three of the readers' ideas won cash prizes totaling $500 in the recent *Factory Awards* contest.

All of them are ways to profits from men on the firing line passed on to other men on the firing line. They deal with methods and equipment that make for direct savings in operation. But they deal, also, with methods and equipment that make for the greater safety, health, comfort, earning power, and security of employees. *Factory* makes it possible to set these profit ways to work. Putting them to work is a sure way to get back into the profit-making habit.

HOW TO USE THIS ISSUE

500 QUICK WAYS TO PROFITS is a handbook of practical ways to cut costs. A timely and a timeless handbook. Timely because it's on the way out of a depression that top management begins once more to okay reasonable expenditures for cost-cutting equipment. Timeless because these 500 ideas will be just as good next year as this.

Only let's not wait until next year.

Some men are not going to wait even until next week. They'll rest easy only when they've read the issue from cover to cover—ads and all.

It's a good way to use it. But a large order. Like galloping through volume SARS TO SORC of the Britannica. And it works in direct proportion to the ease with which we can digest large chunks of information.

Most of us, however, find that we have to take our cost-cutting education in smaller bites. So we're going to leaf our way through these *500 Quick Ways to Profits*, mark certain sections for immediate study, others for more leisurely perusal. Somewhere in that process, of course, we're going to hit an item that's just the thing for that trouble Wilson's been having out in the pattern shop.

Now usually when we see something in a magazine for Wilson, we tear out the page and send it along to him. But not this time. Because this is a reference work. To be kept on file. In plain sight. *Where it can be used.* This week. Next week. *From now on.*

Every so often we'll be seeing something in it for Wilson. For Dixon in shipping. For that eager youngster over in the production office.

We can't go wrong because these are specific jobs or plans or installations or ideas that reduced costs in specific plants. Some of them can be lifted and used "as is." Some will have to be cut to fit special conditions. But this much we know. If they work in a Hoosier pharmaceutical plant, a Yankee textile mill, and a Brooklyn brassiere factory, they'll work for us.

For convenience the 500 items are classified under eight main headings. For instance, if power bills seem high, we open up to "Power and Light." There are 60 items in that section. "Saves $500 a month in fuel costs." "Off-peak power saves $6,500." Etc., etc. Or, if handling and layout and motion economy appear to be our dish, there is a whole section devoted to them. And so on, down the list.

There's an index, too. We need only look up our favorite equipment. Capacitors, conveyors, stokers, wash fountains—they're all there.

Just one word of warning, though. Let's not look for full details. We should have to read full-length articles to get them. Here it's *inspiration* we get. *Ideas. Suggestions. Sparks.* Plenty to set us to figuring how we, too, can use a lift truck or a speed reducer or a duplicating machine to cut our unit costs. Plenty so that we can go right on from there.

MATERIALS HANDLING, LAYOUT AND MOTION ECONOMY

1

One Man and Monorail Keep Materials Always at Hand

One man with a pushbutton-controlled electric monorail and an automatic dispatching system is able to keep all machines supplied with material at all times in a plant making collapsible tubes for toothpaste, cosmetics, and similar products. Time is saved by this installation, and operators are never held up for material.

The system is so set up that signaling from the machine, and dispatching and movement of the monorail bucket are all controlled by pushbuttons.

2

Trucks Save $113.50 a Day

Revamping its handling system brought savings of $113.50 a day to a large pulp mill. Two low-lift trucks, one high-lift truck, one fork truck, and the necessary skids were bought at a cost of $16,000. The investment paid for itself in 141 days.

The high-lift trucks take care of the output of the baling machine: the fork truck loads box cars; and the two low-lift trucks handle pulp from warehouse to shipping. Pulp was formerly moved from warehouse to cars, a distance of about 800 ft., by men with hand trucks. A car is now loaded by a man and his truck in 45 to 50 minutes.

3

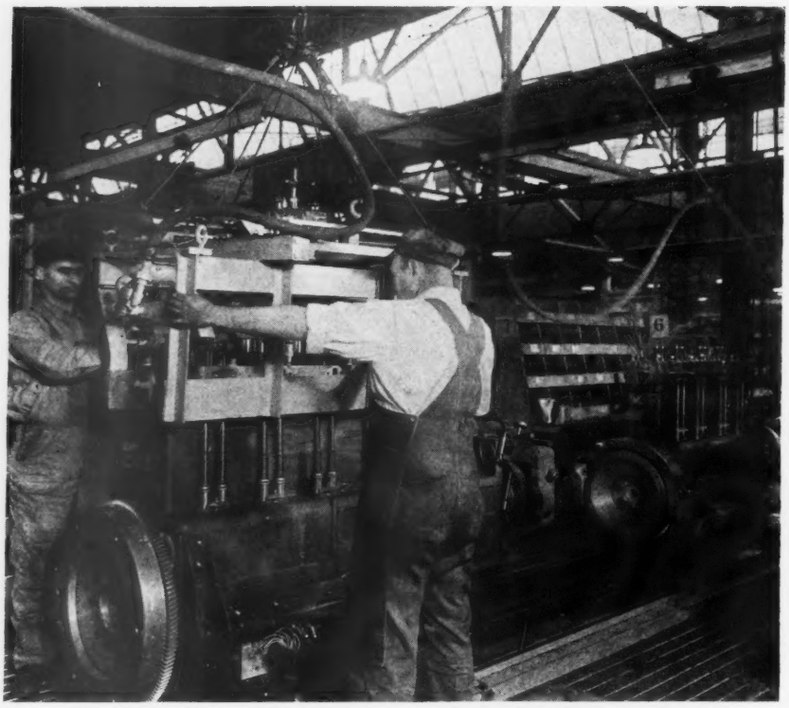
New Layout Eliminates All Needless Walking

In the crating department of a furniture plant, each of four cutoff-saw operators used to walk 10,000 to 12,000 ft. in an 8-hour day. Rearrangement of storage areas cut these daily "constitutionals" to about 1,800 ft. per day, saved 30 per cent in the cost of cutting lumber. Now each has a storage pile at his machine. It was found that the man at the ripping saw had plenty of time to replenish the piles for the other four operators.

4

Cars Loaded in Less Time

One man using a box car loader can now pack cotton-seed hulls into 50-ft. box cars at California Cotton Oil Corporation, Los Angeles, with nowhere near the tiring labor formerly required of two men. Since it's not necessary for the man to remain in the dusty car, a health hazard was eliminated at the same time.



Heavy rig (item 5) enables two men at Caterpillar Tractor Company to use a portable power wrench to tighten tie-rod nuts at 75-lb. air pressure

5

Speeds Up Portable Wrench

Tightening tie-rod nuts at Caterpillar Tractor Company required 75-lb. air pressure, too much for the two husky operators who were manipulating the portable wrench. So a large rig was built and suspended on a pulley with counterweights directly above the assembly line. The two men guide it onto the engine to be tightened, and it slides over the sides so that it is always exactly plumb. The rig weighs 1,200 lb., but the counterweight offsets that. Because of its rigidity, the portable wrench can be speeded up far beyond the speed that could be controlled on a hand-held tool.

6

Returns Cost the First Year

A plant manufacturing metal furniture formerly handled its products by hand, with the aid of floor trucks. Much heavy lifting was required. It was entirely eliminated, and labor costs were reduced markedly by the installation of a hand-geared underhung crane running on the lower flanges of two I-beams with an electric hoist on the crane beam. This crane gives complete coverage of the shipping floor. One man now handles loads that formerly required three or four men. It is estimated that savings paid for the crane in one year.

An additional saving has resulted from the ability to stack material higher, thus conserving floor space.

7

Process Time Is Cut from Six Days to Four

Increased ease of supervision is one of the many benefits enjoyed by the Augusta Knitting Corporation of Utica, N. Y., since moving from a four-story mill to its present all-on-one-floor location. Better still, this concern can now deliver the average order in something like two-thirds of the time formerly needed. It has meant a smaller inventory of work in process and a smaller stock of finished goods. Indeed, goods "march" through so quickly that the management is left with the uncomfortable feeling that this plant is somehow emptier than it ought to be.

8

Test Panel Saves Time

A permanent test panel has relieved one concern from annoyances caused by broken, mislaid, or lost testing apparatus. Instead of pick-

ing up three or four instruments—if they can be found—and carrying them to the motor, the electrician now takes the motor to the testing bench.

9

Handles at a $6,364 Saving

Management of a large industrial organization estimates from its cost records that during three years of operation, a fireless locomotive has saved about $6,364 a year in labor, repair costs, and fuel.

Saving in fuel was the largest item, amounting to about $3,800. In the area where this plant is located, coal costs about $5 a ton, whereas the boiler of the fireless locomotive is charged with low-cost steam generated in boilers that are fired with waste material.

10

From 59 Steps to 22

A spring, 3/8 in. long, used in the manufacture of firearms, was formerly made in 59 steps, traveled 4,041 ft. in its progress through the plant. Today it's made in 22 steps, travels only 285 ft. Credit the improvement to close coordination of layout, motion economy, and materials handling.

11

Saves 25% in Cut-Off Costs

Revision of layout and handling resulted in a 25 per cent saving in bar stock cut-off costs at Westinghouse Electric & Manufacturing Company, East Pittsburgh. Installation of a pedestal-mounted jib crane did the job. Saws used for large work are arranged adjacent to the crane and within range of its boom.

Formerly, all handling was done with an overhead traveling crane, but often there were long waits for the crane while it was in use in another part of the shop. Now crane waiting time has been practically eliminated; bar handling has been converted from a two-man to a one-man job.

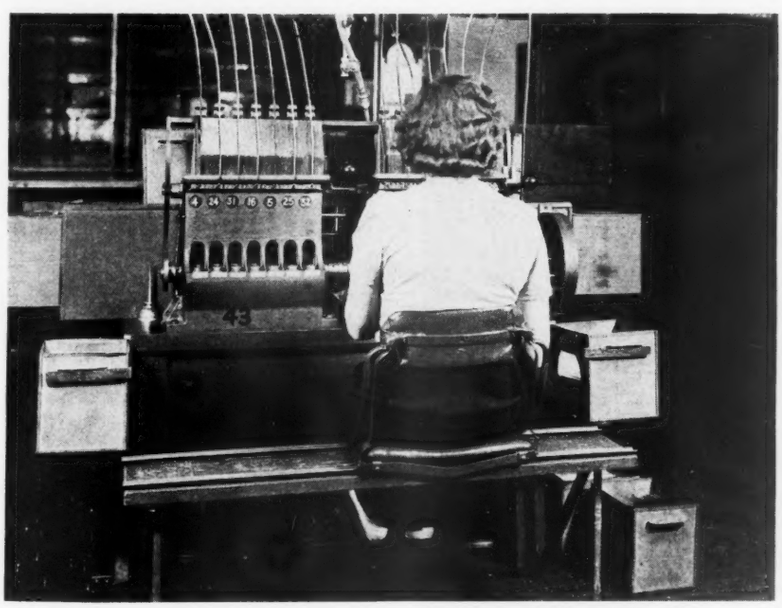
12

She Slides as She Works

Tending machines or batteries of machines that stretch across an expanse of floor broader than an employee can reach is generally considered to compel the operator to stand rather than sit at his work. But this tradition has been violated profitbly by Addressograph-Multigraph Corporation.

Where light machine operations extend only a little beyond a comfortable reach, the operator is equipped with a sliding chair. The chair is made by taking the upper part of a so-called posture chair with the legs removed. This section of the chair includes, when the plant handyman has finished it, a section of light-gage steel edgewise under the seat. In the side sections of this steel base are cut two notches.

In front of the machine to be tended, extending the full width, a bench is built. On it are set two steel angle bars running the length of the bench. The notches on the chair base fit over these angles. Consequently, the operator slides from one position to another without arising, thus greatly lessening fatigue and permitting a steadier and more rapid output with the expenditure of less effort. The entire contrivance costs perhaps $5 to make and install.



Sliding posture chairs (item 12) cost Addressograph-Multigraph Corporation maybe $5 apiece, pay for themselves many times over in increased output

13

No Helper Now, 40% Saving

It was noted in a forge shop that the forger and hammer boy were busy most of the time during the forging cycle; the helper was either idle or holding. Today the latter has another job elsewhere in the plant. Chutes deliver blanks from furnace to forger, carry away completed parts. Brackets support die, which is cooled by sprinkler, doesn't have to be dipped in tank. Gage and knock-out ring are easier to use. Operation is safer, less fatiguing. Two men work faster than three. Time saved, 40 per cent.

14

Reduced Idle Press Time

At Motors Metal Manufacturing Company, Detroit, electric highlift trucks are used to handle dies. Die changes have been speeded up. Idle press time has been reduced. Accidents and injuries to set-up men have been eliminated.

15

One Fixture, Five Gages

One of the results of classes in motion economy at the Allen-Bradley Company, Milwaukee, is a fixture designed for rapid inspection. Porcelain parts are checked for thickness, for throat dimensions, for top recess dimensions, for clearance of inside channel, for spacing of holes in bottom—all in quick succession. Formerly the operator had to pick up, position, and lay down each of the five required gages.

16

Manufacturing Interval Was Downed 87%

Straight-line manufacture of sequence switches at the Hawthorne Works of Western Electric Company cut raw material and process stock investment in half. Piece-part investment was reduced 70 per cent; floor space, 17 per cent; manufacturing interval, 87 per cent. Notable feature of this switch-over from a functional set-up is a continuously moving con-

veyor with double-decked spurs which delivers parts in boxes, selectively keyed so that they will enter any chosen spur.

17
Two Men Do Gang's Work

An air hoist installed at the Kansas City plant of Griffin Wheel Company enables two men to do the same work previously done by a gang. With this installation, one man with a crane and hoist handles a 2,500-lb. bottom-pouring ladle from the metal transferrer to molds on a conveyor, while another man works the ladle valve. The two of them are pouring 200 tons of metal a day—a car wheel a minute.

18
Jib Crane a Money Saver

Two-ton jib crane in Peoria, Ill., factory of R. G. Le Tourneau, Inc., has proved to be a man-saver, time-saver, and therefore money-saver. Mounted permanently in place, its side arm, carrying tracks for the hoist, reaches a working distance of over 25 ft. in any direction, swinging on bearings in a full circle around the upright. Only one man is needed to handle the load and manipulate the control rope.

19
Container Costs $1.28 Less

A heavy crate weighing 542 lb. and costing $4.48 for material alone was formerly used to protect a special type of tank during shipment. Study of the requirements showed how this crate could be made 100 lb. lighter and the strength increased by the use of steel straps. Results of this change were a reduction in cost of $1.28 each and a considerable saving in freight charges because of the lighter weight of the new container. Also handling is easier because the crate can be shipped on its side as a skid, and stored on end to save floor space.

20
34 Months to Break a Link

Long conveyor in a west coast lumber mill has to endure severe and corrosive service, since it is open to all kinds of weather. Plain malleable iron chain formerly used lasted 14 to 16 months. A chain of special metal, rugged and designed to resist corrosion, was installed, and it was more than 34 months before the first link had to be replaced.

21
Easier, Quicker, Safer Drilling

On a drill press operation, the table was so low the operator had to bend to put a gear blank in the fixture, stay in the same stooped position to close it, then straighten up to reach the spindle lever. He was constantly on his feet, constantly bending. Now the spindle is stationary, with table moved to it by an air cylinder; the jig is closed automatically; the operator is seated and, as the part is being drilled, has both hands free to place a completed piece aside and bring up the next. Thus the job is easier, quicker, safer. Saving in drilling time, about 25 per cent.

22
Saves $7,000 on Freight

When a large rise in freight rates was announced, to go into effect on very short notice and during its busy season, a large can factory found its tiering fork truck the instrument for great savings. Choosing to store large quantities of unboxed tinplate in a short time, rather than pay the freight increase, they received 6,000 tons in three weeks, all handled by one man and the truck. The saving in freight charges amounted to $7,000.

23
Speeds Up Small Assemblies

Old way of assembling the arc splitter for a circuit breaker: Parts were dumped on a table. Assembly was slow and painful.

New way: Circular bin set-up enables the operator to assemble eleven arc splitters to every eight of her predecessor's.

24
More Production by Half

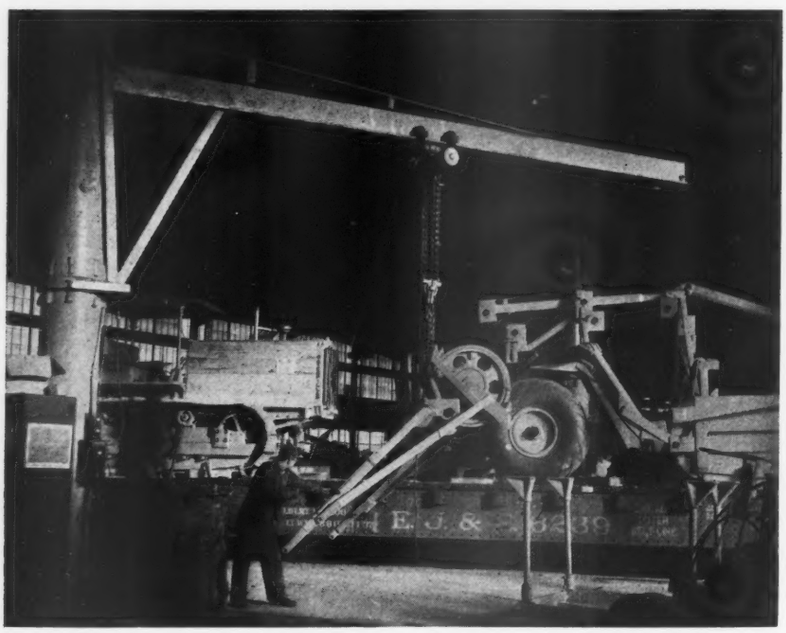
How quality was improved, operation made less fatiguing, production increased 50 per cent. Old way of sewing 1-in. hem in a hat lining was to guide lining by hand. Linings were allowed to fall on floor, got soiled. Second operation was necessary to pick them up. In improved method, a reel relieves operator of guiding lining after strip is started. Lining is wound on reel to keep it from getting soiled or creased.

25
They Ride the Conveyor and Save $97.84 a Day

Men ride on a conveyor and work as they ride in a pottery where heavy fire-clay saggers loaded with fragile, unfired dishes must be moved about.

Before the conveyor, a combination of the chain and monorail types, was installed, saggers had to be lifted and hauled about by skilled operators. Movement of materials was slow. There was a lot of backtracking. Breakage was high. There was too much rehandling both of saggers and dishes.

Saggers are now suspended from



Man-saver, money-saver, are among the names they call this crane (item 18)

rollers running along an I-beam. A chain spaces the rollers and supplies force to move the saggers along. Savings attributed to the conveyor average $97.84 per working day.

26
Now 4 Men Run 9 Machines

A bracket-machining group in one of the Westinghouse plants used to be set up in the good old-fashioned way —nine machines in two straight rows, a man to a machine.

When the motion economist got through with the job, machines had been switched around so that four men run them almost without stirring from their tracks. Of course they couldn't do it without the gravity roller sections and electric hoists that were installed to help them.

27
Ships a Unit for 58c Less

A manufacturer of high-quality copper boilers used to pack his product in heavy wooden crates weighing about 35 lb. and costing 90¢ each.

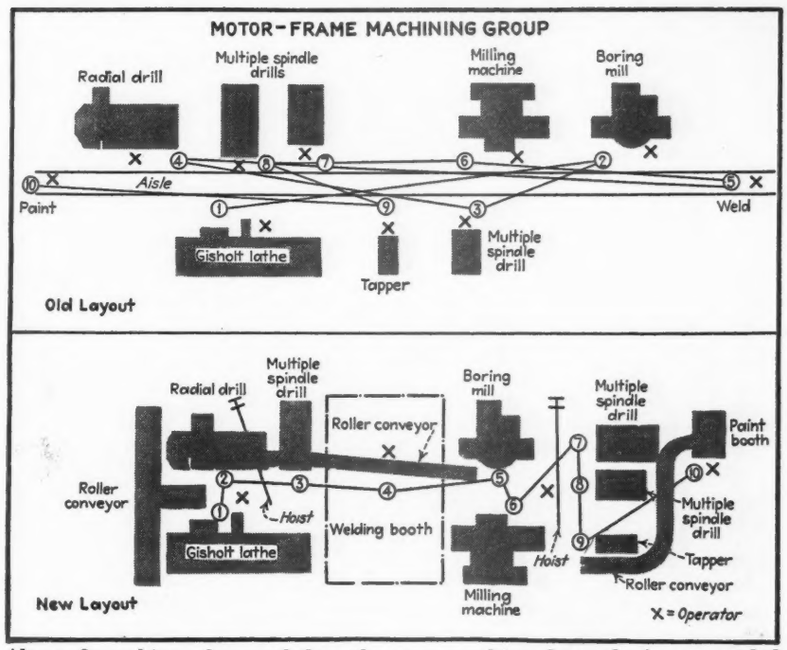
It was found that a standard corrugated container weighing about 5 lb., reinforced with steel straps, would give ample protection and save 58¢ a unit. In addition, there was a reduction in freight charges due to the lower weight of the package—which is also easier to handle.

28
87% Increase on Small Assemblies

When the process chart of a small assembly operation showed that the left hand was chiefly used for holding, the job was set up in the circular workplace manner for two-handed work. Operations are now symmetrical and in opposite directions. No reaching, no holding. Both hands are fully occupied on productive work. Result: An 87 per cent increase in production —from one piece at 0.0105 min. to two pieces in 0.0113 min.

29
Loading Cost Cut from 49c To 24c a Ton

Electric lift and tiering trucks were substituted for hand trucks in the plant of a roofing material manufacturer and worked out so well that now a regular fleet is in operation. These trucks carry and tier skids loaded with 2½ tons of roofing. In loading freight cars, four men and a truck put roofing aboard at a cost of 24¢ per ton. In hand-truck days, it took a gang of six men and three hand trucks to load cars at cost of 49¢ per ton.



Above, 9 machines, 9 men; below, the same machines but only 4 men needed to run them. Credit better layout, gravity rollers, electric hoists (item 26)

30
Doubles Truck's Capacity

Through the simple expedient of building an additional stationary platform over the trailing wheels of its electric truck, a Detroit automobile paint manufacturer has exactly doubled the machine's carrying capacity.

This procedure would not be advisable, of course, where the loads would exceed the truck's rated carrying capacity, but in this case the number of drums carried was limited by bulkiness rather than weight.

31
Packing Costs Down $4,900

Installation of a bundling machine in the plant of a pharmaceutical manufacturer resulted in an immediate saving of 65 per cent on package material costs, amounting to more than $4,900 a year. At the time this study was made the machine was operated at only 10 per cent capacity. Later on these savings were increased greatly under full-capacity operation.

32
Conveyed to Save a Handling

Hand pressers slowed up movement of lace curtains in a lace factory, causing rehandling and frequent mussing. To keep up with production, curtains had to be pressed hurriedly, several at a time.

Ideal movement lay in having these curtains move in an unbroken line from folders to stock or shipping rooms. So a belt conveyor system was designed to move folder curtains under the pressing head of an automatic pressing machine. Now 45 curtains a minute, each pressed individually, move from folders to shipping room without rehandling.

33
8 Hours' Fuel Costs 50c

Cost of handling heavy loads such as tanks and pipe, around the yard of the Champlin Refining Co., Enid, Okla., has been reduced to a very low figure through the use of a diesel-driven tractor. It can be operated eight hours at a cost of about 50¢ for fuel.

34
Flow Methods Assure Quick Deliveries

Machine tools begin "ready to wear," end up "custom made" at Cincinnati Grinders, Inc. Line-production methods make it possible to keep several partially completed machines, with feed boxes, spindles, and upper and lower slides, always in process, permitting them to be finished within

No more waiting on the assembly lines (item 39), so steel stacking boxes saved automobile manufacturing $10,000 the first year they were in use

a few days into any one of many special types.

Although the plan requires 10 to 20 per cent excess machine capacity, the additional investment is more than offset by a savings in floor space, the application of 100 per cent of the men's time to production and machining operations, a large reduction in process and stock inventories, and—best of all—ability to make quick deliveries.

35

20% More Capacity with New Layout

An increase in output, requiring some new equipment, led to a new layout at the Globe-Union Manufacturing Company's 80-man Memphis plant. The improved layout made labor savings as high as 25 per cent in one department—shipping. And the over-all result was a 20 per cent increase in capacity.

36

Four Men Do as Much as Ten

Ten operators used to perform ten machinery operations on motor frames in an electrical manufacturer's plant. The part was moved back and forth from one operation to the next by a materials handler or by the machinists themselves. Machines were not placed so that the operations could follow in proper sequence. Consequently there was much back-tracking.

Now machines have been regrouped. Roller conveyors and electric hoists eliminate all manual handling. No machine waiting time. Four operators suffice.

37

$1,428 from Die Handling

Because it thought it could handle dies more economically with a monorail conveyor, Crescent Forge & Shovel Co., Havana, Ill., installed one. In six months savings of $1,428 or 30.4 per cent were credited to the new equipment. Thus the equipment pretty nearly paid for itself the first 18 months.

38

Crushed Turnings Cost Less To Handle

Crushed metal turnings are more compact and can be handled more easily with less risk of injury to operators. Therefore several automobile plants have effected worth-while economies by appropriate treatment prior to shipment as scrap.

For example, three different metals are handled separately, each being deposited in separate receptacles that are conveniently located in the machine shop. These receptacles are taken to the conditioning plant by an electric truck. Here they are treated in a centrifugal extractor to remove cutting oil, put through specially designed crushers, and then carried by a bucket elevator to individual storage bins, from which they are loaded on cars for shipment.

39

Saved $10,000 on Assembly

Using steel stacking boxes, an automobile manufacturer in Detroit effected a $10,000 saving the first year the boxes were in use. Much of this saving was made by eliminating waste of time on assembly lines.

At each point of assembly where nuts and bolts or other small parts were in use, the parts were kept in the boxes, stacked one above the other. A considerable saving was also made by more profitable use of floor space.

40

Built a Balcony for Storage

When the Ever Ready Label Corporation of New York City found the orders piling in during a recent upswing of the business pendulum, it was on the point of leasing new pressroom space when someone conceived the bright idea of building a storage balcony. Result was an increase in floor space from 9,000 to 12,000 sq. ft. at a cost of approximately 5 years' rental of an additional 3,000 sq. ft. on another floor. The advantage of having pressroom operations all on one floor is obvious. And after 5 years the company will be getting 12,000 sq. ft. of space for the cost of 9,000.

41

13,200 Miles Saved Yearly

When a large electrical manufacturing concern revamped the layout of its d.c. motor department, process flow charts were made of each part, recording each operation, type of equipment, and distance traveled.

The new layout reduced the distance traveled by 35 per cent, which in terms of normal production would mean an annual saving of 13,200 miles. Department floor space was cut 11 per cent; finished-parts storage area, 44 per cent. Inventory of work and material in process was reduced 10 per cent; over-all time required to build a motor, 20 per cent.

42

$13,000 Saved in 178 Days

Unloading china clay from ships is one of many jobs done with a crawler crane at Kohler Company plant in

(CONTINUED ON PAGE 126)

POWER AND LIGHT

43

Saves 35 Tons of Coal a Day

Installation of a pulverized-fuel steam generating unit at the plant of the Kalamazoo Vegetable Parchment Company has reduced the average daily fuel consumption by approximately 35 tons. With fuel costing $4.50 a ton, the daily saving is about $155, or at the rate of $47,000 a year.

The boiler is a four-drum, bent-tube type, equipped with superheater, water-cooled furnace, air heater, and flue gas scrubber. It is designed to produce 150,000 lb. of steam an hour with an efficiency of 83.5 per cent.

44

$240 a Month from Power

Installation of a 100-hp. synchronous motor with 70 per cent leading power factor and another 200-hp. synchronous motor with 80 per cent leading power factor has enabled California-Oregon Paper Mills, Vernon, Calif., to reduce power bills by amounts varying from $180 to $240 a month.

45

Prevents Motor Breakdowns

A textile mill experienced trouble from frequent breakdown of motors through insulation failures caused by excessive amounts of steam and moisture. A number of the motors that were operating under the most severe conditions were replaced with new ones whose insulation had been specially designed and treated to make it highly resistant to moisture.

These motors have now been in service for more than two years without a single failure or sign of trouble.

46

Pays No More Penalties for Low Power Factor

Installation of a large air compressor driven by a 150-hp., 80 per cent power factor synchronous motor was followed by a marked improvement in operating conditions. For example, a heavy penalty was paid every month for low power factor. The corrective effect of the synchronous motor eliminated this penalty and made it possible for the plant transformers to carry 20 per cent more load.

Other important savings have been brought about by the five-step control with which the unit is equipped. If the demand for air is above 50 per cent of the capacity, the compressor will run at constant speed, with suction valve unloading. When the demand is below 50 per cent, the control switches the compressor over to automatic start and stop, so that it is always operated at the highest efficiency, without any attention from an operator.

47

Merely Replace Pushbuttons

Highly corrosive fumes in a chemical plant caused a great deal of trouble with the pushbuttons controlling motor drives. Various costly designs of pushbuttons were tried in the effort to obtain the absolute reliability required, but all failed within a few months. The best and cheapest solution was found to lie in the use of sturdy but inexpensive buttons that are replaced every two months.

48

Power Tools on Own Circuit

One plant found it worth while to run a special 110-volt line for portable tools, equipped with polarized receptacles, so that operators cannot plug the tools in on lighting circuits, as was the former custom. It caused too much breakage of lamps and interference with the lighting system.

49

Check Voltage First

Low voltage on the system is a common cause of sluggish action of contactors and relays. Coil designs are made for certain voltage ratings. Standard coils will operate the associated devices on voltages as low as 85 per cent of normal for a.c. coils, and 80 per cent for d.c. coils. System voltages may, however, drop to values so low that operating coils either do not actuate the devices at all, or only in a sluggish manner.

Time can often be saved through eliminating this cause of trouble, by checking the voltage, before looking for other possible causes of unsatisfactory operation.

50

Better Light, Fewer Errors

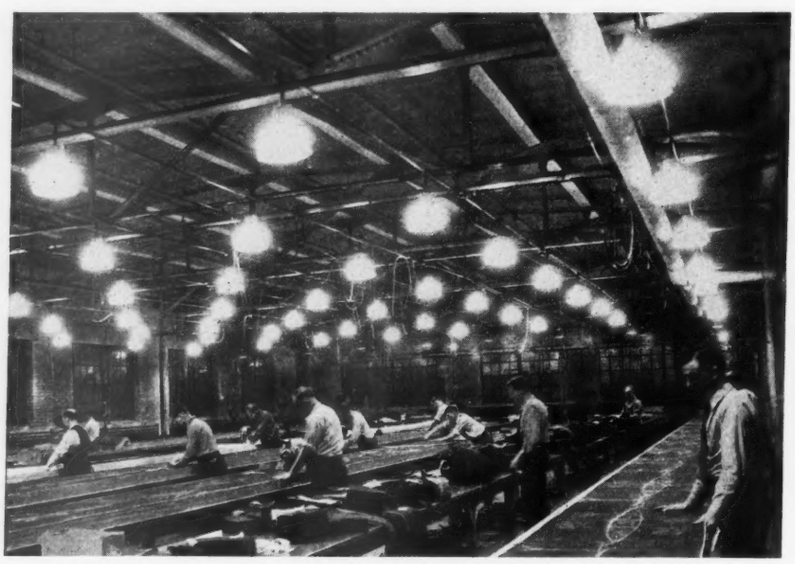
Costly mistakes are infrequent. Accidents have been reduced in number. Labor turnover and training costs have been cut. General supervision has been improved. It's all happened since Oshkosh B'Gosh Overall Company changed its lighting. Old installation provided 4 to 7 foot-candles; new (eight 300-watt units per cutting table), 55 to 60, without glare or shadows.

51

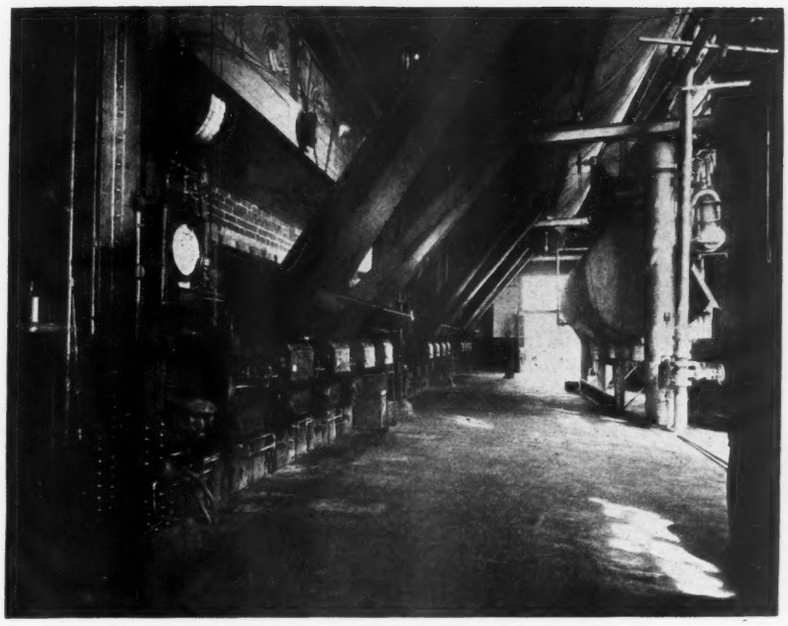
Power Bills Shrink $2,399

In a plant that was having trouble because of low voltage at motor terminals, charts from a graphic meter showed a power factor of about 70 per cent with all machines in operation. Further study pointed the way to a considerable saving in power costs.

With 398 hp. installed, the total load was 238 hp., giving 160 hp. idle capacity. The investment in idle mo-



Credit this lighting job (item 50) with the worth-while savings that accrue from reduction of mistakes, accidents, labor turnover, and training costs



Stokers at Transue & Williams (item 53) account for 11 per cent more steam

tor horsepower, with controls and protective devices, was $3,375. Average efficiency of all motors at operating load was 83 per cent, whereas properly loaded motors showed 88.4 per cent efficiency.

It became apparent, therefore, that a saving of $705 a year could be made by raising the power factor, that increased energy consumption by too-large motors was costing $1,152 a year, and that interest and depreciation charges on the excess capacity of these motors and associated equipment amounted to $542, making a total of $2,399.

52

Capacitors Pay 50% a Year

Power factor in an eastern metal-working plant, ranged on the average from 54 to 64 per cent. Installation of 75 kva. in capacitors raised the power factor to a minimum of 80 per cent during periods of maximum demand, with resultant lower line losses and better voltage regulation. Installation cost was about $1,500, while the average saving is $854 a year.

53

Ups Steam Production 11%

Following the replacement of three old stokers with units of more modern design, at the Transue & Williams Steel Forging Corporation, Alliance, Ohio, there was an 11 per cent increase in evaporation per pound of coal, with no increase in the cost of fuel. Also, the former banking loss when shutting down, which amounted to 2 or 3 tons each with the stokers formerly used, has been eliminated. In addition, steam pressures can be kept more uniform; there is more flexibility in operation; and the work of the boiler room crew has been lightened.

54

Photocell Light Control

Manual control of departmental lighting systems usually leaves much to be desired, because lamps seldom are turned on and off at the proper time. The result is that they either are allowed to burn needlessly, or the intensity of illumination falls below a desirable level.

Automatic control, by means of a photoelectric relay avoids these extremes, assures maintenance of adequate illumination at minimum expense.

55

Eliminates Costly Delays

Changes in products and methods resulted in the production of much more dust than was formerly present in some departments of a large plant, with steam and moisture in others. Serious trouble soon developed with the electrical control equipment. There were many costly delays and maintenance costs reached unprecedented heights. This situation was completely cleared up by replacing most of the old equipment with moisture- or dust-proof pushbutton controls. In a few instances it was possible to move existing control equipment to other locations where conditions are less severe.

56

Stokers Save $3,140 a Year

Down went fuel costs 43.7 per cent when Hannah Pickett Cotton Mills at Rockingham, N. C., installed stokers and adopted automatic coal firing. This mill, which turns 20,000 bales of cotton into fabric each year, found that the move raised boiler efficiency 63 per cent, returned an estimated annual saving of $3,140.

57

No More Juice, But Much More Light

Bare lamps in ordinary round reflectors, formerly used in illuminating stock bins at the International Harvester Company, resulted in spotty lighting. Clerks frequently had to move closer to a light in order to read typewritten slips, or to identify parts numbers.

By installing reflectors especially designed for such service a higher intensity was obtained from top to bottom on shelf surfaces and in the interior of the bins, with a sufficient increase in the uniformity of general illumination to enable clerks to read comfortably anywhere in the aisles. To obtain these results it was not necessary to use larger lamps or increase current consumption.

58

Ran Two Years, Still O.K.

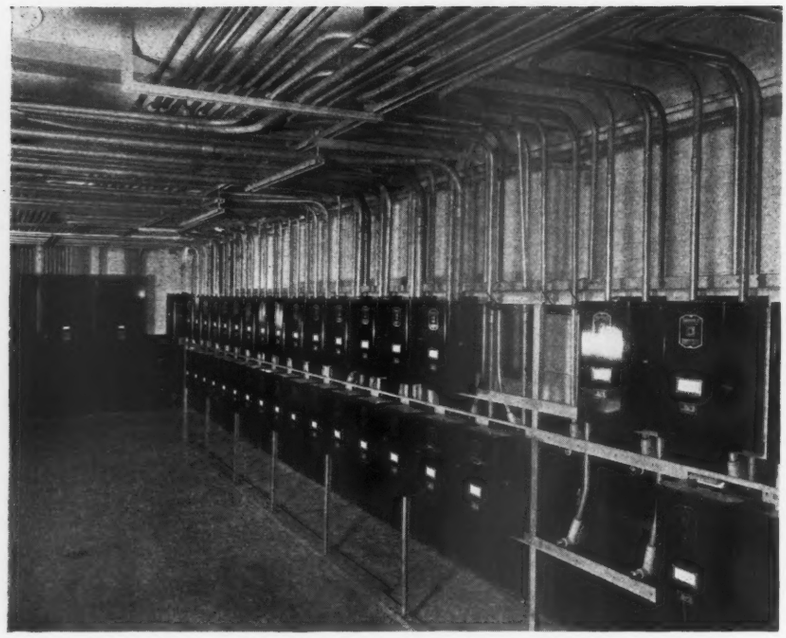
One of the large auxiliary motors in a steel mill was exposed to such severe conditions that rewinding or extensive repairs were required two or three times a year. These repairs, and the cost of production delays, amounted to hundreds of dollars a year.

This open-type motor was replaced with a totally inclosed, fan-cooled design, which ran for two years without a sign of trouble. At the end of this period it was removed for overhauling, but when torn down it was found to be in perfect condition.

59

Why Modern Transformers

Important improvements have been made in recent years in the design, construction, and materials used in transformers. In many cases where a larger new transformer unit can be used to replace two or more smaller



Fireproof rooms for motor-starting and control equipment at Ditzler Color works (item 60) reduce fire hazard, increase safety, cut maintenance cost

old units, or where three-phase can be used instead of single-phase, the saving in losses alone will justify the change.

60

Separate Control Rooms, No Fire Hazard

Segregating all motor-starting and control equipment in five separate fireproof rooms at the plant of Ditzler Color Company, Detroit, has reduced the fire hazard, increased safety, and reduced maintenance costs. These rooms open only to the outside; hence they are free from dust produced by handling and grinding pigments, as well as flamable fumes given off by paint solvents.

61

Increases Production 35%

In a polishing room, operators were turning out 85 per cent of assigned production. Lighting was increased from 16 to 35 foot-candles. Now production is 120 per cent of schedule.

62

Wasn't the Motor's Fault

Serious delays were caused by the extreme frequency with which the motor driving the mash tub in a brewery blew its fuses. When a graphic wattmeter was put in the motor circuit, the chart showed a heavy overload on the motor, which was traced to the bearings of the agitator. Following installation of ball bearings, the load dropped to about half the rating of the motor, resulting in a considerable saving of power.

Further tests showed that the motor on an air compressor was too small. Interchanging these two motors resulted in each being properly loaded, with consequent improvement in power factor.

63

Irons Power Peaks to Save $200 a Month

The connected load in the plant of a paper products manufacturer is 2,075 hp., of which 985 hp. is in the beater room. Monthly power bills average around $2,675. In an effort to reduce these costs a graphic wattmeter was used to study operation of the plant from the electrical side.

Charts showed that in the beater room a peak load occurred when the first shift went on. This was followed by a valley, with another peak about noon. During the second shift the load dropped about 25 per cent. In the third shift the load built up for about two hours and then declined to approximately one-fourth of the morning peak.

Study of the operating time of each motor in this department showed how operations could be scheduled to avoid pyramiding the load. Four months after the new schedule went into effect the power bill had dropped to about $2,475, representing a monthly saving of almost $200.

64

Pays $5,400 to Douse Lights

In a steel mill it was found that 35 per cent of lamps rated 400 watts or more were left burning when not needed. An educational campaign reduced the number of lamps left burning needlessly to about 5 per cent, with a saving of $5,400 a year.

65

So Motors Can't Flood

Two 100-hp. motors located in pump pits close to a couple of slurry basins in a cement mill were occasionally flooded when pump casings broke or other mishaps occurred. Usually the motors were burned out; in any event, cleaning and drying them out was expensive and took time.

Such troubles were eliminated by installing a float switch in each pump pit. These switches were set so that 4 in. of slurry collecting in the pits will close the contacts. That action causes a bell to ring and opens the circuit breakers, thus shutting the motors down.

66

Watch Ground Connections

Grounding of electrical apparatus and other equipment, or metallic parts that may come into contact with current-carrying parts, is a highly important safeguard against injury to personnel and damage to property. When first installed, ground connections usually are adequate and effective, but many factors tend to destroy their usefulness by increasing the resistance.

Such changes in resistance may take place within a comparatively short time. Therefore, all ground connections should be carefully checked at sufficiently short intervals to make sure that they are always in proper condition.

67

Coal Bills $5,000 Smaller

During a test period from March to December, 1936, two pulverized-coal-fired boilers each of 35,000-lb. steam capacity an hour at the Sucrest Sugar Refinery, Brooklyn, were controlled manually in accordance with meter readings. Beginning in January, 1937, these boilers were automatically operated at test efficiencies by meter controls.

Records showed that evaporation

was raised from 9.908 to 10.6 lb. of steam per pound of coal, a difference of 0.692 lb. of steam. In terms of coal this means a saving of 976 tons annually, costing $4,967. At a cost of $4,056, the meter controls paid for themselves in considerably less than a year.

68

Photocells Prevent Jams

Two elevators serve the bottling line at the W. & A. Gilbey, Ltd., plant of National Distillers Products Corporation, Cincinnati. They remove cases from one conveyor line and deposit them on another two stories above. About four or five times a month an imperfect case would stick at discharge and the elevator would jam, damaging at least one case and keeping 54 people "at ease" while the trouble was being cleared up.

Now there's photocell control on the elevator motors, and the elevator shuts down automatically before any imperfect case can cause it to jam. To resume operations, the faulty case has merely to be removed.

Since the photocell installation more than 800,000 units have been handled; the electric eyes have never failed to protect the two elevators.

69

Saved Transformer Losses

Tests showed that the week-end and holiday no-load losses of a bank of three 200-kva. transformers supplying power to a metal-working plant amounted to about $285 a year. Lighting circuits were supplied by a separate single-phase transformer. When the plant was shut down there was no load on the main transformer bank except during the winter, when about 6 kw. was used by several small, three-phase motors in the heating system. Replacing these motors with single-phase machines operated from the lighting transformer made it possible to take the large transformers off the line on week ends and holidays, and eliminated the no-load losses.

70

Staggers Load, Cuts Demand

High demand charges for a metal-working plant led to a study of operating schedules which resulted in the saving of several hundred dollars a month. Highest peak came during the first hours of operation in the morning, with another but less pronounced high-peak period after the lunch hour. Morning peaks in particular were traced to the practically simultaneous starting of several large motors and throwing a number of electrically heated furnaces on the line. Later the load dropped considerably.

Arrangements were made to have several furnaces started from one-half to one hour earlier, and the time for starting work in three departments was changed to keep the demand in any 15-min. interval at its lowest possible value. In consequence, demand peaks and charges dropped markedly.

71

Upped Power Factor to 93%

Installation of 500 hp. in leading power factor synchronous motors resulted in raising the power factor of a paper mill from 68 to 93 per cent. This improvement in conditions brought about a worth-while saving in demand charges, and a lower rate for energy.

72

Demand Charge Down $66

Graphic charts of demands imposed by a large plant showed an occasional peak much higher than the average. To prevent these peaks a contact-making wattmeter was installed with a pressure switch and solenoid-operated unloading valve for a large air compressor.

The contact-making wattmeter was set at a predetermined demand. When this demand is maintained for 1½ min. the air compressor is unloaded. Cost of the change was about $300. In the first month a saving of $66 was made in demand charges.

73

Cure: Splash-Proof Motors

In several departments of a large packing plant some of the motors were frequently exposed to falling water through overflowing of tanks and other mishaps. Motor failures and production delays were frequent and repair cost high.

Trouble of this sort was eliminated by the installation of splash-proof motors whose insulation was especially treated to make it highly resistant to moisture.

74

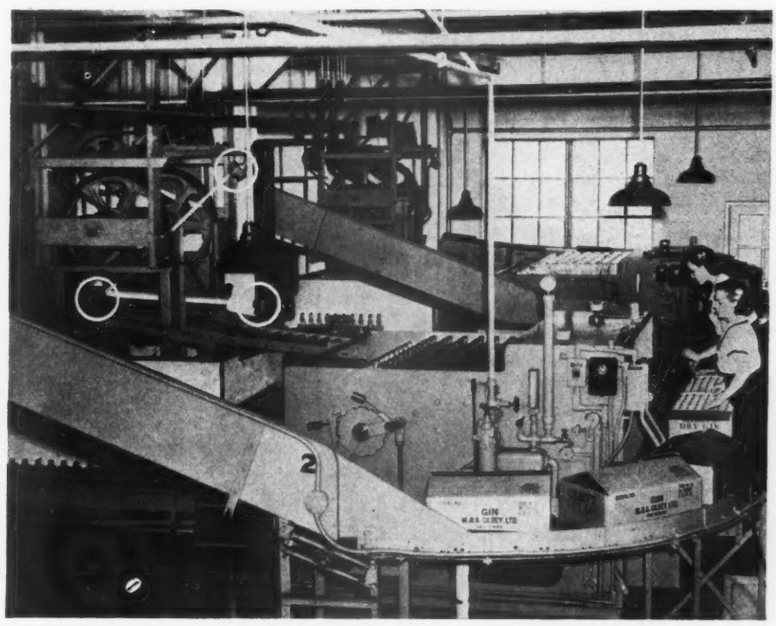
Boiler Meters Pay 391%

Two boiler meters in the power plant of the Montgomery Company, Windsor Locks, Conn., made it possible to decrease steam costs $0.17 per thousand pounds. This saving represents a weekly average of $110.50, or about $5,750 a year.

75

$1,000 Wiring Job Pays Out In 9 Months

A survey to discover the cause of unsatisfactory operation of electrical equipment in a stationery manufacturing plant showed that the switchboard



Elevators that used to jam four or five times a month in the Gilbey plant will never jam again. Reason, a photocell installation (item 68)

By checking insulation resistance at regular intervals (item 76), this concern has caught many a costly motor breakdown before it actually happens

equipment was inadequate and overloaded; feeder circuits were heating badly, due to overloads; insulation was in bad condition.

Installation of a new three-phase, four-wire distribution system gave rise to an advantage in metering and made it possible to operate all equipment simultaneously at full speed, which formerly could not be done. Cost of the new wiring was about $1,000. Saving in power losses returned this cost in nine months. Better voltage conditions have led to a considerable increase in production per kilowatt-hour.

76

Meter Your Motors to Stop Costly Breakdowns

Use of an insulation resistance meter makes it possible to keep a much closer watch on the condition of motor windings, circuits, and so on, than can conveniently be done in any other way.

A motor on which successive readings, taken at intervals of a month or more, indicate that the insulation resistance is decreasing, should be dried out and varnished, or given whatever treatment is needed to restore it to proper condition.

77

Clean Fuse Clips Pay

Overheating of fuse ferrules and blades occasioned by poor contact in dirty, corroded, or loose clips, will cause fuses to blow on less than their rated loads. This costly and annoying condition can be prevented by making sure that clips are clean and tight. Simple clamps are available that will help to insure good contact.

78

Overtime Output Up 50%

A plant was operating certain departments one hour overtime each day, to catch up with orders. When a graphic wattmeter was connected in the power line, during a study of electrical conditions, it was found that production on overtime periods was about 50 per cent too low. The meter charts showed a decided tapering off in activity after the regular closing hour.

On the basis of this information the manager changed the overtime period to the first hour in the morning, and output immediately rose to normal. Since the increase in production was nearly 50 per cent, the saving was in proportion.

79

Best to Burn Your Lamps at Rated Voltage

Maintenance of rated voltage on lighting systems is essential to maximum efficiency of operation. For example, if a 200-watt lamp is burned at 90 per cent of its rated voltage, the life will be considerably increased, but the lumen output will be only 70 per cent of normal, and the unit cost of light nearly 117 per cent of normal.

If operated at 10 per cent overvoltage, the lumen output rises to 137 per cent of normal, lamp cost per 1,000 hours rises to 344 per cent, and unit cost of light falls to 93.8 per cent.

80

More Light, Fewer Headaches

Installation of high-intensity mercury-vapor lamps over sorting tables raised the intensity of illumination from 18 to 30 foot-candles and stopped all complaints about eye strain and headaches.

81

More Steam with Less Coal

Results obtained with between 40 and 50 stokers in the various plants of the National Dairy Products Corporation have shown that it is possible to handle anywhere from 25 to 30 per cent more product with the same coal consumption as formerly. In the Cleveland plant, for example, 33 per cent more product was handled, while burning coal that costs about 10 per cent less.

It is the experience of this company that stokers pay for themselves in about four years, sometimes during the first year, depending on the boiler and the type of coal previously burned.

82

Lamp Shows Up Open Breaker

Motor outage time, due to the opening of the circuit breaker, is kept to the minimum in one plant by having each breaker equipped with a contact that lights a red lamp, when in the open position. Circuit breakers for each motor in a certain area are located in the substation serving that area. When any breaker opens, a red lamp above it lights up and another lamp showing the substation affected lights on the supervisory board in the electrical department.

With this arrangement, service can be restored in about the length of time it takes a machine operator to find his foreman and report stoppage of the motor. And, of course, there is correspondingly little interference with production.

83

Stops Unexpected Starts

Complete failure of voltage, or lowering to the point where motors trip off the line, is a common occurrence—certainly an ever-present possibility. When operators are likely to be injured or equipment damaged, if motors unexpectedly start up when

voltage is restored, control with low-voltage protection must be used. Then the motors must be intentionally started by the operators or other persons.

With low-voltage release control, motors will start automatically as soon as voltage is restored. It is commonly used with blowers, centrifugal pumps, and similar drives.

84

Check Circuit Breaker Interrupting Capacity

Adequacy of the switchgear should be carefully investigated whenever any changes are made in the power supply that may increase short-circuit current, in the event of a fault, to the point where it exceeds the safe rupturing capacity of the equipment. Going from generated to purchased power is a common example of such a change.

Possible loss of life, fire, extensive damage to equipment, or serious delays to production may result if protection devices are not able to handle the current that may flow through a fault.

85

Returned Cost First Year

Greater production made it necessary for the Murray Corporation of America to increase the electrical capacity of the plant to improve low-voltage conditions. Capacitors were installed on various power feeders. Cost, including installation, was less than $13,000. Average saving in power bills is $1,200 a month. This investment will thus pay for itself the first year.

86

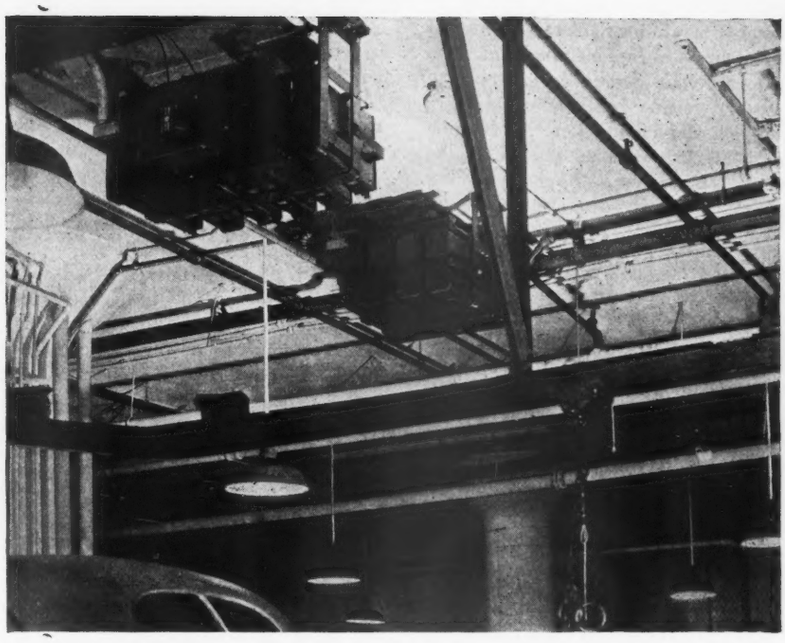
Meters Pay Out in 5 Months

Installation of five steam flow-air flow boiler meters on four 308-hp. and one 450-hp. boiler at the plant of The Spaulding Fiber Company, Tonawanda, N. Y., resulted in a saving of 10 per cent of the fuel consumed, or about $500 a month. It is estimated that the cost of these meters was paid in five months, through the savings brought about by their use.

87

Saved $2,000 in 4 Months

"We purchased capacitors to correct our power factor," says the operating head of a West Virginia concern. "Figuring our power cost under the old contract, and comparing it with power cost under the new contract, our savings were $2,005.41 for four months. Complete installation cost was a little more than $5,000. And, in addition to actual dollars-and-cents savings, we have not had any substation troubles at all, whereas under previous conditions we experienced quite a number of substation failures and interruptions."



Capacitors at Murray Corporation of America (item 85) cost less than $13,000 to install, save $1,200 a month, will thus return first cost the first year

88

Thin Shim Stops Sticking

Residual magnetism sometimes causes relays to stick, resulting in faulty operation of control equipment. The simplest remedy is to fasten a piece of brass shim stock or other very thin non-magnetic material to the face of the magnet core. If this separator is thick enough to make an appreciable airgap, on a.c. equipment, overheating of the coil is likely to occur.

89

Conveyors Can't Go Wrong

Manual control of several elements of a complicated materials handling system required operators of more than average intelligence. Even with such operators, errors were frequent and often resulted in considerable damage.

A change to pushbutton control, with proper interlocking to prevent damage in case of error, eliminated all trouble. There was a further advantage and saving in the fact that operation of the equipment can safely be entrusted to the comparatively low-grade labor employed in this plant.

90

Interlocking Stops Damage

Interlocking the control of two jordan engine motors with the compensator of the stock pump motor eliminated trouble formerly experienced in a paper mill. When either or both of the jordan motors stopped for any reason the headbox usually overflowed before the stock pump motor could be shut down, and the jordan motors were submerged. Now, when power goes off the jordans, the stock pump motor also stops.

91

Prevents Motor Failures

Since a textile mill has adopted the practice of designing feeder circuits to carry 50 to 100 per cent more than the immediate load, motor failures due to overloading have been drastically reduced. During the past five years there has not been one failure among the motors driving certain important types of equipment.

92

High P.F. Saves $1,400

As small motors were installed from time to time in a hosiery mill, the power factor kept dropping until it reached the very low level of 34 per cent. Feeders were overloaded and heated badly, and performance of the

motors was unsatisfactory. Small capacitors were installed at the motors. The power factor rose to 80 per cent, heating of feeders stopped, and motor operation became normal. At the same time billed demand was reduced 45 per cent and the total cost of power was cut more than 32 per cent, representing a saving in excess of $1,400 annually.

93

Electric Bills Down $200

The contract under which a cereal products plant purchases electrical energy does not contain a power factor penalty clause, but the demand rate is such that low power factor has an important effect. Installation of a 150-kv. capacitor reduced an average demand of 576 kva. to 424 kva.. with a saving in power cost ranging from $200 to $250 a month.

94

Burns Cheaper Coal, Saves $180 Monthly

By converting the boilers of Haeger Potteries Company, Dundee, Ill., from hand-fired operation to stoker firing, steam costs have been reduced to 17 cents a thousand pounds.

In this boiler room two 150-hp. boilers, operated alternately, generate steam for engines and pumps, and for heating in winter. The stoker had to be adapted for firing either boiler, since only one is fired at a time, and management wanted to keep capital investment at a minimum. To this end the feeding mechanism was located separate from the boiler brickwork and setting, and can be switched from one boiler to the other.

With hand firing only selected coal of high grade could be burned. But the stoker can burn all the various grades mined within 50 to 100 miles of the plant. Coal costing 90c. per ton less than formerly is being used, and tonnage consumed is less. Actual savings have been $180 a month.

95

Buys Power, Saves $2,500

Power formerly was supplied at the plant of Wallace & Company, Brooklyn candy manufacturers, by two steam-driven generators. Machines were driven by d.c. motors.

Realization that the equipment was obsolete and that operating and maintenance costs were high, led to a decision to purchase all power instead of generating it. The old d.c. motors and controls were replaced with new a.c. equipment. Rearrangement of drives made possible a material reduction in the total connected horsepower that was required.

Direct savings are about $2,500 a year in addition to other savings resulting from the lower cost of purchased power.

96

Right Motors Save Money

When selecting the size of motor required for a drive, the ratio of running time to shutdown time must be considered. Most motors are able to deliver considerably more than their continuous-rated horsepower, but sustained heavy overloads will cause a dangerous rise in temperature. On the other hand, overloads of considerable magnitude can be carried for short periods without harm. As a general rule, when the per cent of idle time is greater than the running time, thus giving the motor time to cool off, money can be saved by choosing an intermittent-rated motor.

97

Gloom Gone, Accidents Also

Handling freight at night on the shipping platform of one plant was a gloomy job. Poor lighting invited accidents and mistakes, and there were plenty of both. Following the installation of new lighting units with reflectors designed to eliminate shadows and glare, there was a marked increase in the tonnage of freight handled, and an equally marked reduction in the number of accidents and mistakes. The new system provides 12 foot-candles over the entire platform.

98

New Wiring Reduces Losses $100 a Month

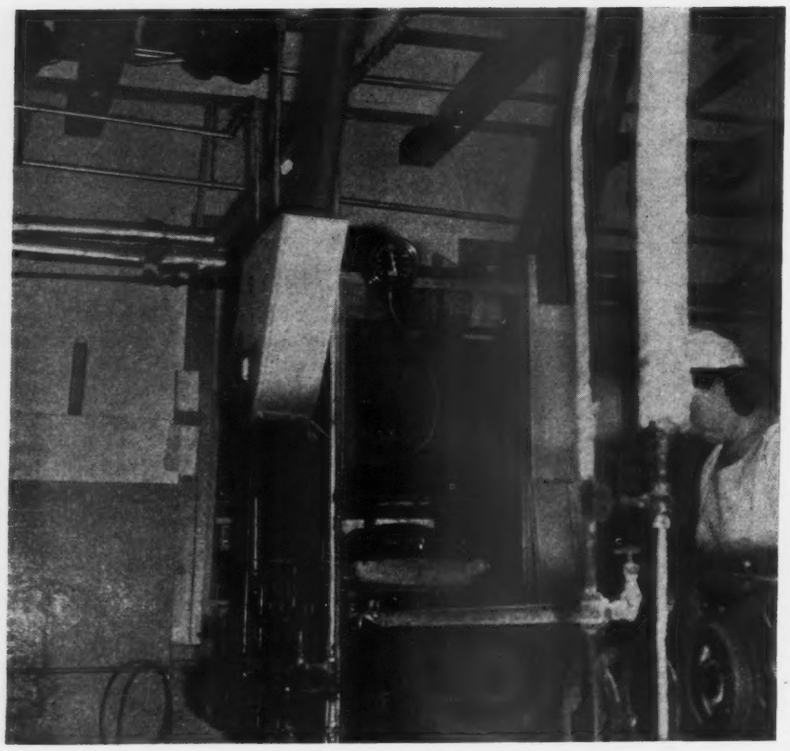
Power circuits in a large creamery were in such poor condition that service interruptions were frequent. After rewiring the plant and overhauling the motors there were no more interruptions due to electrical failures. There has been a further saving of $100 per month in power losses.

99

Get the Most Out of P. F. Correction

Correction of power factor frequently will give a gratifying return on the investment. Maximum return, however, depends on striking the proper balance among several factors. To determine the percentage of correction that will give the maxi-

(CONTINUED ON PAGE 128)



Candy establishment saves $2,500 a year (item 95) by purchasing its power

MECHANICAL POWER DRIVES

100

Many Speeds for Conveyor

A variable-speed transmission with 5:1 ratio solved the problem of securing different speeds for a slat conveyor in the plant of a manufacturer of gas stoves, Standard Gas Equipment Corporation, Baltimore. This conveyor, which is 150 ft. long, carries parts from one plant to another. Its speed must be varied to conform with production schedules and the size of the parts handled.

101

Grease Guns Saved $375

Use of air-operated grease guns in the Berkshire Mills, Fall River, saved enough on lubricants to pay for three of these guns in one year. They are valued at $125 each.

102

Never a Burned-Out Bearing

When three high-speed presses were installed in a large printing plant the same lubricants that had been applied to the old presses were used. Trouble immediately developed. Bearings ran hot and failed frequently. Such troubles practically robbed the new equipment of all its advantages.

After the conditions had been analyzed, a special grease designed for high speeds and temperatures was applied. The resultant 25 per cent saving in lubricating costs has been exceeded by the saving in bearing maintenance. There has not been a gearing burn-out during the past five years.

103

Saves on Motor Maintenance

At the St. Louis Steel Casting Company, sand and dust quickly found their way into the plain bearings with which the motor driving a molding machine formerly was equipped; it was practically impossible to build effective seals.

Before the installation of ball-bearing cartridges in this motor, the average life of bearings was just under four months, making it necesary to keep a spare motor available and change motors three times a year, at an estimated cost of $100 annually. Since adoption of the ball bearings, the motor has been in continuous service without trouble of any kind.

The company is now converting all plain bearings in motors, as they are brought in for repairs, to the ball-bearing type.

104

Changed to an Alloy Shaft

An investigation made after a line-shaft broke showed that the shaft had been badly overloaded by the addition from time to time of new machines. Obviously a larger or stronger shaft was needed. However, use of a larger shaft would have meant replacing all bearings, clutches, and pulleys.

The heavy expense of such a change was avoided by installing a chrome-nickel, 40-carbon steel shaft of the same diameter as the old one. The higher tensile strength of this shaft enabled it to carry the load without difficulty.

105

Eliminated Bearing Failure

One textile mill has not experienced a bearing failure in the four years since grease lubrication once a week by a pressure gun was substituted for hand-oiling twice a day.

In addition to the savings in labor and the cost of bearing replacement, smoother operation of the machines has resulted in better "take-up" and fewer seconds.

106

Clutch Saves 60 Horse

Motor standby charge was cut down and power factor improved by installation of a friction clutch at a pipe tumbling mill in Birmingham. When a unit for cleaning 18-ft. lengths of pipe was direct-connected to the motor, 80 hp. was needed in starting. Use of the clutch allowed the starting load to be picked up gradually and only 12 hp. was required for starting.

There was an immediate saving of 60 hp. in connected load, power factor was bettered, and the capital outlay was returned in a few months.

107

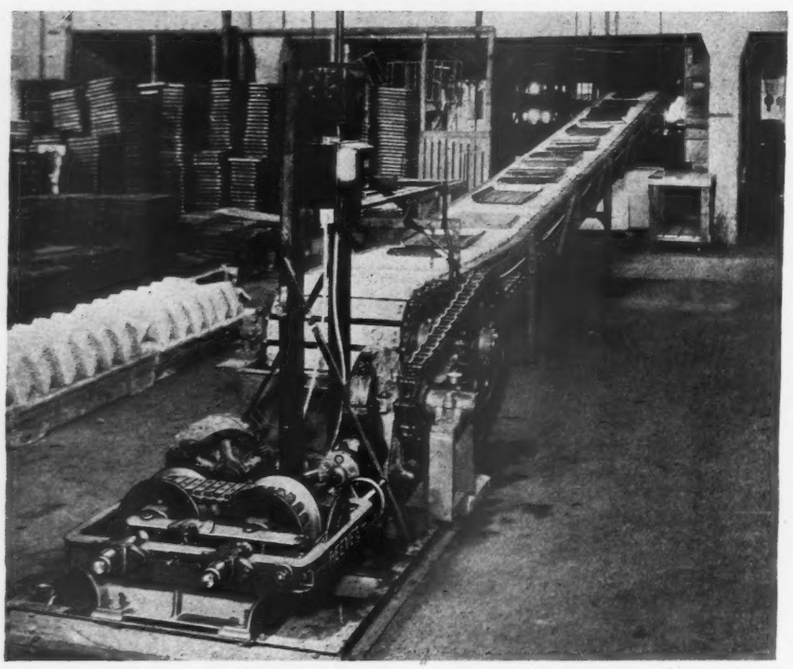
This the Place for Grease

A tool manufacturing plant formerly used a barrel of oil a week, the equivalent of 432 lb. of grease, for lubricating screw machines, hammers, and other equipment. Following a change to grease lubrication in place of oil, it was found that a 400-lb. drum of grease lasts about 15 months.

108

Cut Out One Cut

Three variable-speed transmissions were installed to drive fly knives of a paper cutter used to cut sheets to different lengths at the end of the paper machine, at Mac Sim Bar Paper Company, Otsego, Mich. They have eliminated an additional cutting operation formerly needed to get the paper down to allowable tolerances. Before their installation it was im-



Speeds on this slat conveyor at Standard Gas Equipment Corporation can be varied (item 100) to conform with production schedules and size of parts

possible to hold sheets within ¾ in. of the desired length. Paper had to be cut oversize, then cut again in a press cutter. Paper stock was wasted and unnecessary labor cost incurred.

109

Cuts 25 Hp. Down to 10

In rehabilitating an old mill which it had taken over, the Scio-Ohio Pottery Company, Scio, Ohio, found it necessary to make many changes in the method of driving some of the machinery. For example, in one department three glaze mills and a stain mill were formerly driven by one 25-hp. motor which was located in another room. In order to obtain the necessary reduction in speed, a complicated arrangement of lineshafts, jackshafts, and open spur gears had been employed, with a clutch at each mill to permit starting and stopping as needed.

Under the conditions it was felt that the best results could be obtained by driving each mill individually through a speed reducer. Accordingly, a 3-hp. motor and reducer were installed for each of the glaze mills, with a 1-hp. motor for the stain mill, making a total of 10 hp., instead of the 25 hp. formerly used.

110

Filler Tank for Grease Gun Saves Time

Use of a filler tank for grease guns has resulted in a great saving in time required to lubricate the anti-friction bearing idlers of a belt conveyor in the factory of the Bunting Brass & Bronze Co., Toledo, O. Since the tank holds 35 lb. of lubricant, a grease gun with a capacity of 9 oz. can be refilled many times before it is necessary to return to the stockroom for a fresh supply of lubricant. The filler tank can easily be carried from place to place in the plant. It forces lubricants into the grease gun through the handle.

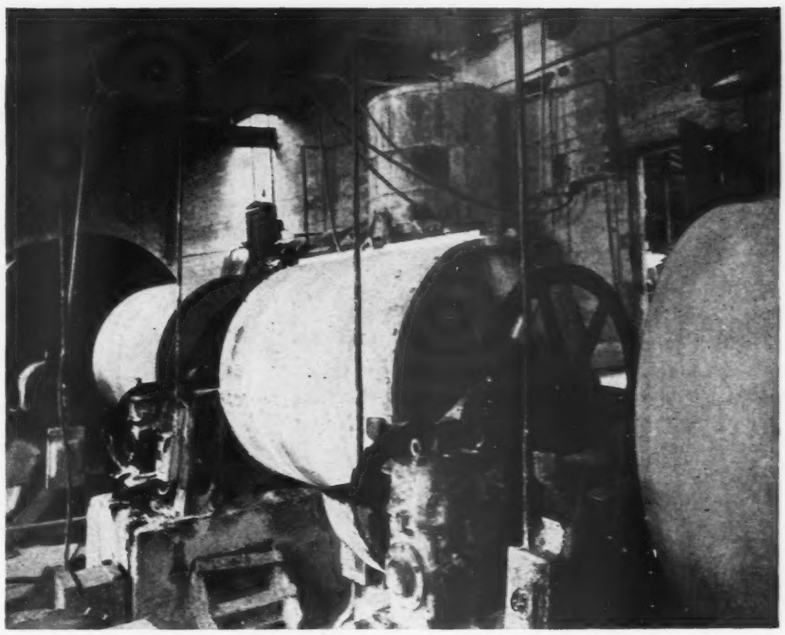
111

Varied the Speed to Save

Glazing jacks in the plant of a manufacturer preparing skins for shoe leather are run at less cost and get out more production since driven by a variable-speed transmission. Reason for this is that black and colored skins must be glazed at different speeds, and the ratio of black to colored skins varies with fashion's fancies.

When the 55 jacks were run at constant speed, they had to be stopped and pulleys changed when a different speed was wanted. To run at a lower speed than necessary meant cutting down production. To stop and change pulleys was to incur an expense of $6 for each change, lose production, keep piece workers waiting.

Now, 23 jacks are operated at a constant speed of 150 strokes a minute, 15 are run at 175 strokes, while the remaining 17 are driven by variable-speed transmissions, to permit handling skins of any color.



Motor-reducer drives on one stain and three glaze mills (item 109) cut the horsepower from 25 to 10 in one department of the Scio-Ohio Pottery Company

112

Belt Life Upped 3 Times

Average life for belts formerly used on universal winders in a textile mill was 130 days. After a change had been made to a different type of belt, a study showed that 22 out of 100 belts had an average life of 349 days, operating 24 hours a day, while 78 were still in good condition after 365 days' operation.

The new belt costs about 68 per cent more, but has between two and three times longer life, resulting in a large net saving in belt cost.

113

Ups Its Output 20%

Production records show that U. S. Steel Wire Spring Company, Cleveland, increased production by more than 20 per cent by installing individual-motored, variable-speed drives. Torsion machines and coilers used in spring production have to be driven at various speeds, depending on the gage of wire used.

Before the adoption of adjustable-speed drives, making speed changes was slow work and meant serious delays to production.

114

Drives Fan Troubles Away

When the belt driving a ventilating fan in the hardening room of a file and saw factory broke down, which was often, the heat and fumes forced the men to lay off.

Replacement of the old belt with one of a different type that is better suited to the conditions cleared up all trouble. It is estimated that the new belt has paid for itself many times over in the elimination of maintenance expense and loss of production time.

115

Avoids Costly Change-Over

Short life and frequent trouble with the belts driving high-speed finishing machines from a line shaft in the plant of a cutlery manufacturer, led to serious consideration of the advisability of driving each machine by its own motor.

Studies showed that each machine would require a 2-hp. motor. Also, that the trouble was due in part to the short center distances of the belts. Eventually the finishing machines were divided into two groups of ten, each driven by a 10-hp. motor from a

lineshaft placed beneath the floor, which gave a longer center distance. Belts of a different type from that used previously were installed between machines and countershafts.

There has been no further trouble with belts, and the cost of installing individual motors was avoided. They would have added 20 hp. to the connected load.

116

Those Little Drops of Oil

Occasional drops of oil from the bearings on overhead drives spotted the product in a rayon plant. No trouble has been experienced from that cause since the lineshafts were placed in trenches under the floor.

117

Under-the-Floor Drives Pay Handsome Returns

Why not put group drives under the floor? Trenches for lineshafts provide maximum efficiency of operation and effective utilization of floor space. A knitting mill in Virginia, the Tubize Chatillon Corporation, at Hopewell, has twelve trenches, each containing three lineshafts.

This arrangement has been very satisfactory. One important advantage has been the complete elimination of static charges on the belts, formerly the cause of a good deal of trouble. Valuable manufacturing space has also been reclaimed; it was used primarily to widen trucking aisles.

118

Weld When Keyways Are Worn

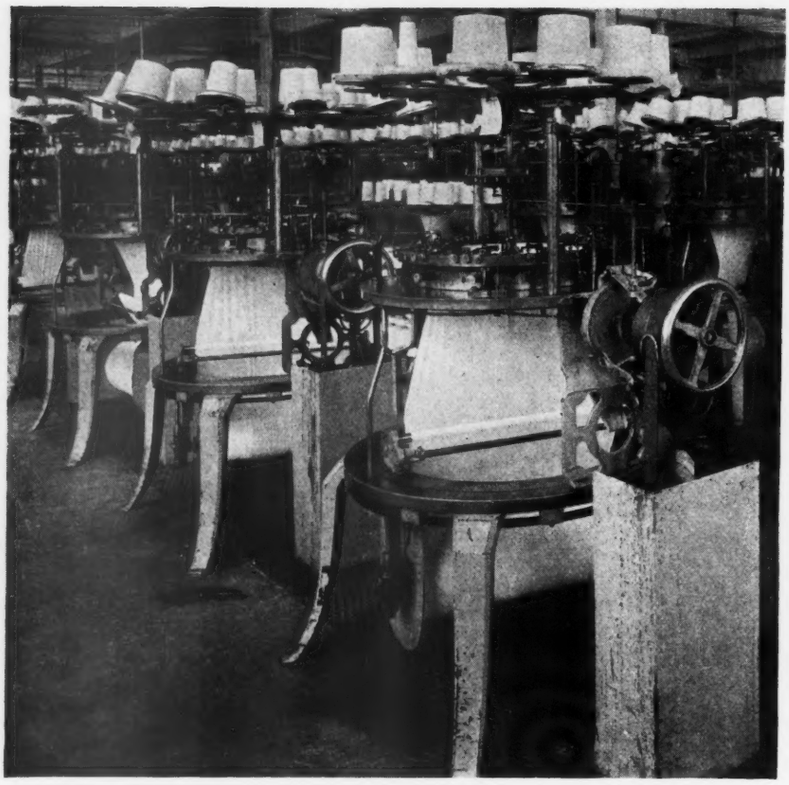
Considerable machining time and labor can be saved in replacing pulley and gear keys by a simple welding trick. When the keyway becomes worn so that the pulley or gear is loose on its shaft, an oversized key, tipped with a thin welded-on layer of a hard-facing alloy, can be driven into place. If the hard-faced end has previously been sharpened, it cuts its way to a snug fit, and lasts considerably longer than a new key.

119

19% More Work from Presses

In an automotive plant, installation of a centralized lubrication system on the toggle presses increased productive time as much as 1½ hours in an 8-hour shift. This represents an increase of nearly 19 per cent. It was formerly the practice to lubricate these presses once during each 8-hour shift, requiring from 1 to 1½ hours when done by hand and necessitating shutting down the press.

Since the value of the output of a press usually is rated between $30 and $75 an hour, the new lubricating system gave a large return on the cost. With it a press can be lubricated in one or two minutes. There is also a large saving over the labor required for hand lubrication.



Valuable manufacturing space was reclaimed and aisles were widened when the Tubize Chatillon Corporation (item 117) put its lineshafts under the floor

120

Comb Removes Belt Static

A metal comb mounted on a well-grounded support and placed close to a belt will prevent the accumulation of excessive charges of static electricity. The comb is commonly placed close to the outer surface of the belt, although when conditions are severe it may be advisable to apply one comb to the outer surface and one to the inner surface as well.

One disadvantage of a comb is that a discharge takes place in open air between it and the belt. If this slight discharge is considered to be objectionable, fine wire springs may be soldered to the comb and allowed to ride on the belt. These springs will serve to ground the belt surface directly and more or less effectively.

Combs or springs must, of course, be thoroughly grounded by connecting them to a water pipe or low-resistance ground. It is also well to ground all machine frames, lineshafts and countershafts, and any other equipment or structures on which static charges may accumulate.

121

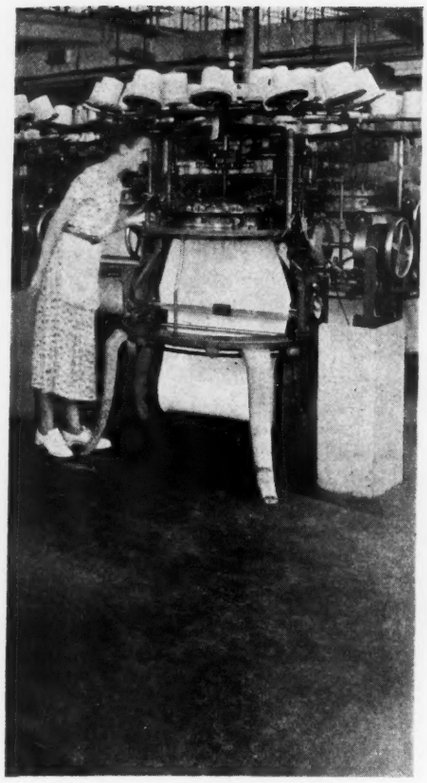
20 to 30% Power Savings

A variable-speed transmission operated by an automatic hydraulic control replaced a steam engine drive on a fan supplying forced draft, to four boilers. Fan speeds must be varied from 120 to 740 r.p.m. to maintain 150 lb. boiler pressure. The Hagar Strawboard and Paper Company, Cedarville, Ohio, at whose plant the installation was made, estimates that the drive has made time and power savings of between 20 and 30 per cent.

122

Saves Cost of New Motor

Load on a motor driving a lineshaft had reached the point where it became necessary to take one machine off. This machine imposed a heavy starting load, but after it was up to speed the power requirements were much less. At first it was proposed



to drive this machine by a separate motor, but a careful checking of the load on the lineshaft motor showed that it could safely carry the running load of the machine. Therefore a friction clutch was installed on this machine. The clutch is disengaged when the lineshaft is started and then slowly engaged when the motor is up to speed. Use of this clutch made possible a worth-while saving both in floor space and money.

123

A Grease a Week's Enough

In a bakery with a capacity of 7,000,000 cookies a day—the Salerno-McGowen Biscuit Company, Chicago—the machines formerly were oiled once a day. After they had been equipped with the proper fittings, it was found that an application of grease once a week provided satisfactory lubrication.

124

Oiling Costs Down $12,000

Savings in excess of $1,000 a month were realized in one rubber factory by the installation of a centralized lubrication system on the various mills. With hand oiling, eight men were required to do the work, whereas the new system has made it possible for two men to handle it.

Another large saving results from the fact that the cost of lubricants consumed on the various mills was reduced by more than 90 per cent. Maintenance and repair costs were also cut, and the serious trouble formerly experienced with hot bearings was eliminated.

125

Just Enough Space

Use of gear motors enabled one plant to save space and avoid costly changes when machine layouts were changed. It was essential that a number of machines be placed close to a wall, which meant that little space was available for the motors and drives.

126

$1,400 Less Waste a Month

On a large paper corrugator, whose speed had to be varied for different kinds of stock and for splicing ends of rolls, a variable-speed motor and control gave trouble and was replaced with a mechanical variable-speed transmission.

Since installation of the new transmission there has been no down time chargeable to the driving equipment. Value of waste materials, of which there is always a certain amount in this operation, was cut from $2,750 to $1,350 per month—a $1,400 saving.

127

Watch Shaft Alignment

Lineshafts should be checked once a year or as often as necessary to assure a proper alignment. Settlement of buildings, loading of the floor above and other conditions all tend to throw shafting out of line with the result that power consumption and bearing wear are increased, sometimes to a surprising extent.

128

Now Automatic Tension

Limited space through which the motor could be moved on its slide rails made it difficult to maintain proper tension in the belt driving a lineshaft. Mounting the motor on a pivoted base so arranged that the belt supports part of its weight solved the problem of keeping this belt tight.

129

Called For a Chain Drive

Layout of equipment in one plant made it necessary to drive two parallel lineshafts placed one above the other and fixed on a center distance of several feet from one motor. At first one shaft was driven from the other through bevel gears and a short piece of shafting. However, much trouble was experienced from breakage of the gears. In addition, the drive was very noisy.

At last a chain drive was installed between the two shafts and cleared up all trouble. To avoid whipping, an adjustable idler was put on the pipe side of the chain.

130

Smooths Out Impulses

A few heavy pulleys on a lineshaft will smooth out impulses that otherwise would be transmitted to bearings and belts, and frequently affect the quality of the work. It is advisable, however, to have these pulleys dynamically balanced. If this is not done, the fly-wheel effect may be more or less counteracted and each pulley give an impulse of its own to the shaft.

131

One Coupling Not Enough

Impossibility of keeping parallel misalignment between two shafts within the limits that could be handled by a flexible coupling caused much trouble in one plant. Couplings had to be replaced frequently and bearing wear was abnormally high. These troubles were eventually overcome by the use of two flexible couplings installed with a short section of shaft between them.

132

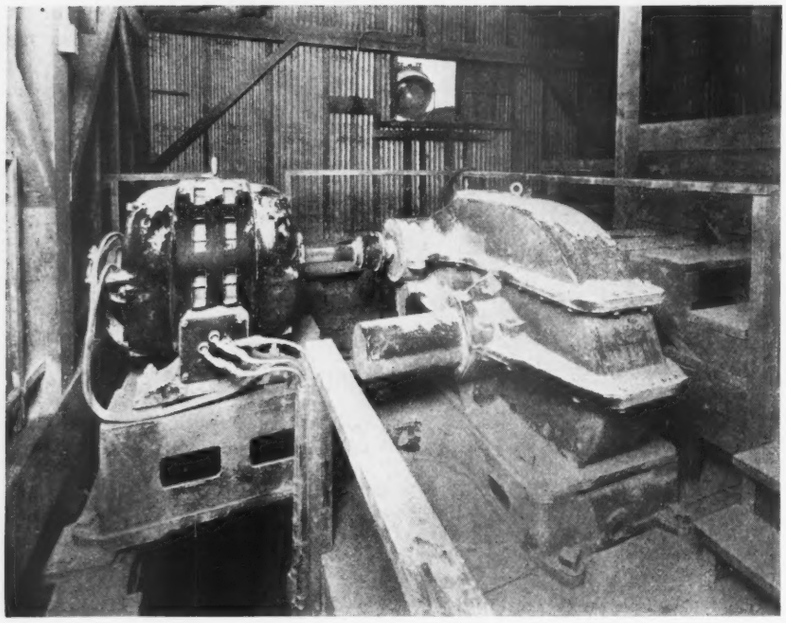
$4,590 Less for Power

Watervliet Paper Company, Watervliet, Mich., estimates power savings of 20 per cent as a result of the installation of herringbone gear speed reducers. Absence of slippage in the speed reducers used on the most important drives in the plant results in this saving which, with electric current costing 1 cent a kilowatt hour, amounts to $4,590 a year.

133

Maintains Any Frequency

A variable-speed drive was used in one plant to obtain different frequencies for testing instruments. A test set was made up consisting of a 1,200-r.p.m. synchronous motor, variable-speed transmission, and an a.c. generator provided with a frequency meter. The synchronous motor and the generator were connected to the variable-speed device by silent chains. By ad-



Shutdowns that used to cost Illinois Electric Limestone Company some $270 an hour have been eliminated (item 136) by installing nine speed reducers

justing the variable-speed device it is possible to secure and maintain any frequency between 20 and 70 cycles.

134

Cured a Flapping Belt

A number of machines that impose a high peak load once each revolution were formerly driven by a flat belt, operated on 14-ft. centers. Flapping of the belt was troublesome, and relief was sought by maintaining more tension than would otherwise be needed. The excessive tension brought its own troubles in the form of shorter belt life and increased wear of bearings.

All these difficulties were cleared up by reducing the center distance to about 6 ft. and installing a type of motor base that automatically keeps constant belt tension. An incidental advantage was a considerable saving in valuable floor space.

135

After Cutting Keyseats

Shafting should be straightened after keyseats have been cut, since removal of the metal tends to distort the shaft.

136

Saves $270 an Hour with Speed Reducers

Nine double-reduction, herringbone gear speed reducers and flexible couplings installed by Illinois Electric Limestone Company, St. Louis, at its Falling Springs quarry have eliminated frequent shutdowns suffered when spur gear drives were used.

Any conveyor or elevator shutdown made 25 of the highest-paid men idle and reduced production 5 carloads of limestone an hour. This was a cash loss of approximately $270 an hour.

137

Heavy Pulley, Steady Load

Use of an extra-heavy driven pulley is one of the best ways of smoothing out a pulsating load that causes flapping of the belt.

138

Variable Speeds Pay Out

When Illinois Coil Spring Company, Chicago, built a plant addition and moved all automatic coiling equipment into it, a variable-speed transmission was put on all but one machine. That machine operates constantly on the same job.

Before the move, coiling machines were run at constant speed on each job and when a job was completed pulleys were changed to vary the speeds as required for the next run. This task took 25 to 30 min.—so much time that changes were not made during working hours, and machines frequently were run 10 per cent or more below their most desirable speeds until changes could be made. Of course, a considerable loss in production resulted.

The increase in production shows that variable-speed transmission units were paid for several times over in lost production in 8½ years of operating the coiling machines at constant speeds.

139

Don't Let That Chain Jump

As the parts of a silent chain gradually wear, the pitch lengthens, as evidenced by the chain riding farther out on the teeth of the sprocket. If allowed to run long enough the chain will eventually jump over and skip the teeth of the sprocket, destroying it. Therefore, it should be replaced before this point is reached.

140

Small Groups More Flexible

Providing separate group drives for each department gives one plant the flexibility it did not possess with the old steam engine drive formerly used. Power was wasted as it was transmitted from floor to floor, partly because it was impossible to keep the long lineshafts in alignment.

141

Only an Inch Out, But—

Exact parallelism of shaft on which a chain drive is installed is essential to long life and freedom from trouble. In one plant a 50-hp. chain driving an air compressor had given trouble in the way of noisy operation and frequent breakage almost from the time it was installed. All attempts to remedy the trouble failed until by the use of an accurate measuring device it was found that the 50-in. long motor shaft was out 1 in. of parallelism.

After the motor has been shifted to bring its shaft into exact parallelism with that of the compressor, there was no more trouble with the chain.

142

Locate Hangers Right

Risk of lineshaft breakage can be lessened by placing pulleys as close as possible to the hangers. With heavy pulleys it is often advisable to put a hanger on each side.

143

Silent Chain Answered

An open gear drive transmitting 100 hp. at a considerable reduction in speed gave so much trouble that a change in the method of driving became imperative. Difficulty of access

(CONTINUED ON PAGE 132)

HEATING, VENTILATING, AND AIR CONDITIONING

144

Fast Cooled, Faster Packed

Noxzema Chemical Company, Baltimore, wanted to pack its product faster, so installed air conditioning to reduce cooling time. In the cooling chamber (maintained at 40 deg. F., 54 per cent relative humidity), material is cooled from 140 deg. F. to room temperature in 40 min.

145

Costs 15% Less for Heat

Three years ago Downing Box Company, Milwaukee, replaced direct-radiation heating with 26 unit heaters. Since that time many thousand square feet of floor space have been added in new buildings, and through rearrangement of unit heaters as well as machinery, the same number of unit heaters adequately does the heating job. The company estimates fully 15 per cent savings.

No longer is the plant overheated in fall and spring. Cold spots in sub-zero weather are also things of the past. Besides, new material can be stacked along walls without interfering with the heating.

146

Stops Summer Slumps

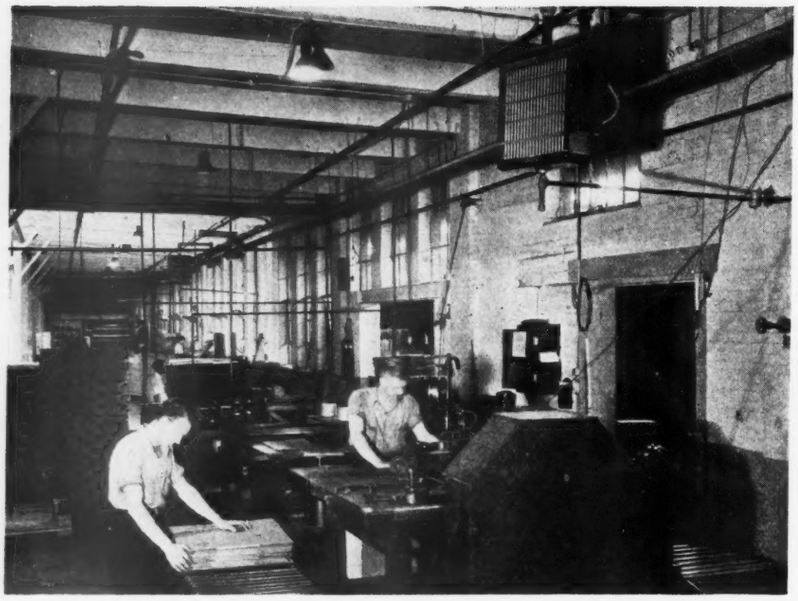
Men working around hammers and presses at Lefere Forge & Machine Company, Jackson, Mich., suffered from the heat of the white-hot metal handled. Conditions were especially bad on hot days. And if there was a succession of hot days, continuous production was impossible. Output was cut as much as 50 to 70 per cent.

Six blower systems, one for each machine unit, solved the problem. Mounted approximately 10 ft. from the floor, each delivers its full volume over one man and blows heat and fumes away from him. The men now work continuously; production delays have been eliminated; and illness has been cut 'way down.

147

Graphic Records Leave No Doubts

Recording instruments offer the simplest means of keeping track of the operation of air conditioning equipment. Where close control of conditions is essential, graphic records are almost invaluable in detecting irregularities that might otherwise be unnoticed, or abnormal conditions that may seriously influence product quality.



Cold spots in sub-zero weather are things of the past since Downing Box Company (item 145) replaced direct radiation heating with 26 unit heaters

148

Removes 98% of Fine Dust

Precipitation of dust particles as fine as 1/5 micron with 98 per cent operating efficiency is possible with an electrostatic air-cleaning unit. A particle 1/5 micron in diameter measures about 0.000,007,63 in., say 1/1,000 of the diameter of a human hair.

149

Cool Air Helps a Creamery

A midwestern creamery found that artificial cooling of its butter wrapping department solved several problems and was a distinct aid all around.

150

More Rigid Inspection

Air-conditioned, soundproof testing rooms for electrical appliances assure greater accuracy and more comfortable working conditions for operators at the East Springfield, Mass., plant of Westinghouse Electric & Manufacturing Company.

The final test on an electrical appliance is made to insure quietness of operation, and high mechanical and electrical efficiency. While making it, it is desirable to eliminate outside interference.

A central conditioner and distributing duct system provide a continuous flow of air of controlled temperature to several test booths. The duct is lined with sound-absorbing material and is connected to the test booths by means of canvas connectors. All air may be recirculated, or some recirculated with fresh air added.

Operators have been found to be more alert and better able to conduct the tests since the adoption of air conditioning.

151

Keeps Attendance at 99%

Employee attendance is about 99 per cent constant at the plant of Bayuk, Inc., Philadelphia, thanks to air conditioning.

A complete change of air is produced in the eight-story building once every six minutes. Quality control was the objective in making this installation, but just as important in the results is the effect on 4,000 employees, 90 per cent of them women and girls. Lost time due to illness has been practically negligible. Management estimates an efficiency gain of 5 to 10 per cent.

152

No Chance for Explosion

In rooms at the new plant of Campana Corporation, Batavia, Ill., where motors are used and there is even a remote chance of alcoholic vapors escaping into the atmosphere, air-conditioning and ventilating equipment is interlocked with the motors. If ventilation ceases to be positive, motors cannot be run and the danger of sparks is held down. To be sure, all electrical equipment is explosion-

proof in any department where there exists even a theoretical hazard from alcohol fumes. But the ventilation interlock is to make things doubly sure.

153

Pays Out Many Times

Washed air is maintained at 55 per cent relative humidity and 70 deg. F. in the air-conditioned printing department and bindery of J. B. Lyon Company, Albany, N. Y., resulting in elimination of register trouble caused by stretching and shrinkage of sheets. Increased feeding speeds have been possible, and the controlled weather has done away with cracked paper, much slip sheeting, and many ink, gluing, and roller troubles. It is estimated that the cost has been recovered many times.

154

Product's Always Fresh

Trouble experienced by a candy manufacturer in keeping chocolates in good condition while in storage disappeared when a cooling unit was installed. Now the storage room can be kept at the right temperature, no matter how hot the weather.

155

Costs Less, Always Warm

Former practice in one plant was to let building temperatures drop to 50 deg. F. at night, in order to save steam. Study showed, however, that live steam had to be used for heating in the morning, just when boiler capacity was taxed to meet other demands.

Now buildings are kept at the same temperatures day and night, by exhaust steam. It costs less to do it this way. Buildings are warmer at starting-up time, workers more comfortable.

156

Canada or Panama, to Order

A manufacturer of papers used in protecting food products has found that it pays to test the various papers and inks under the atmospheric conditions to which they will be subjected in different parts of the world. Reason: A paper that is perfectly satisfactory in a cool, dry climate may not serve so well in the heat and humidity of the tropics. Air-conditioned testing rooms permit the maintenance of any desired temperatures and humidity.

157

Small Fan Dries Basement

Necessity of putting a couple of men to work in the basement under a factory building presented the problem of adequately ventilating the area, which was very damp. Existing provisions failed to do the job. Then an 18-in. duct leading to the floor above was brought down to within 6 in. of the floor. An 18-in. fan was installed in the discharge of the duct, the cold, damp air on the floor was easily drawn off, and the basement was dried out in a short time.

158

Pipe Out, More Room In

As much as possible of the piping for a central dust-collecting system in a large shoe factory was installed on the outside of the building. All joints were soldered to prevent water from entering, and the piping was carefully painted. Advantages obtained by this method of installation include: Minimum interference with both natural and artificial light; reduction in hazard from fires that may occur in the system; greater ease of installation.

159

Now Year-Round Operation Is Possible

For more than half a century the Taylor Provision Company, Trenton, has manufactured a highly seasonal meat product known as "Taylor's Pork Roll," so sensitive to changes in temperature and humidity that it could formerly be packed only during the "oyster" months. Self-contained automatic condensing units and ammonia-cooled spray-type units installed in the curing room of the plant now make it possible to manufacture this product through the year, with no seasonal shutdowns and consequent loss of markets to competitors and of employed time to wage earners in the plant. Continuous operation has also reduced fixed charges per unit of sale.

Now that Taylor Provision Company is air-conditioned (item 159), it packs this highly seasonal product the year round, not during oyster months only

160

Fewer Colds by 46%

Installation of air conditioning equipment in the main office of a utility company reduced lost time due to coughs and colds 33 per cent during the first year. The reduction was 46 per cent the second year.

161

Out Go the Fumes

A large gravity-type turbine ventilator was installed in the roof of a one-story building to remove objectionable fumes given off by one of the processes. Unavoidable and fairly strong cross-currents of air from doors and windows frequently prevented it from functioning properly. After study of the conditions it was decided

to erect a hood over the source of the fumes and connect it to the ventilator. Headroom of 6½ ft. was provided. There has been no further trouble.

162

Unit Heaters Cut Fuel Cost

Installation of 40 unit heaters with zone control reduced heating fuel costs from 3¾ to 2¼ cents per sq.ft. for Mack Truck Company, Long Island City. Zone control permits boiler room engineer to regulate temperatures of all departments. Boilers are fired less than two hours before work is started.

Besides the fuel savings, valve and trap maintenance now costs less, skylight breakage caused by proximity to the old heating coils has been eliminated, and production has been increased because uniform temperature speeds drying in the paint shop.

163

No More Fog in the Foundry

Unit heaters lick hazardous foundry fogs in two minutes at Malleable Iron Range Company, Beaver Dam, Wis. Generated after pouring, the fog used to be so bad in winter that it was almost impossible for men to stay on their jobs after each pouring.

164

Better Product Now, So No More Costly Returns

Hot summer days were costly for Waxide Paper Company because the waxed paper it manufactures would stick to the rolls during processing. Also, bakers had to return many rolls of paper on which the wax had run, so that it could not be used on the bread-wrapping machines.

By air conditioning its two plants in Kansas City and St. Louis the difficulty has been overcome. The saving is several thousand dollars yearly. The 10,000 C. F. M. fan in each installation is arranged for two-speed operation so that the blower can be run at low speed during the winter for ventilation.

165

Fans Reclaim Hot Spot

Heat from a large kiln was so intense that workers could not stand it; hence, valuable floor space was going to waste.

Installation of two fans at the opposite side of the kiln solved the difficulty. The fans draw in cool air from the outside, blow it across the top of the kiln and down the other side. What was once a hot spot now has a comfortable temperature.

166

Reclaims Two Basements

Two large basement areas were made suitable for manufacturing operations by means of air conditioning. What now are two large weave rooms at Riverdale & Dan River Cotton Mills, Inc., Danville, Va., were formerly unproductive space.

Temperatures of 100 deg. F. used to be common in these areas, but they are now kept down to 85 deg., with accurate control of relative humidity at 85 per cent. Automatic equipment controls air handling, humidification, and heating.

Waxed paper no longer sticks to the rolls. Quality is better. Returns are fewer. All since Waxide Paper Company (item 164) air-conditioned its plants

167

Smooths Out the Peaks

A manufacturer of cough drops could not carry much stock because the lozenges tended to melt and stick together. The result was difficulty in promptly filling early fall and winter orders. Installation of air-conditioning equipment remedied this condition, made possible a large increase in output without additional facilities, and helped to stabilize employment by smoothing out peak production demands.

168

One Fan Does Work of Two

Naphtha and enamel fumes are exhausted from the cleaning rack and spray booth by one exhaust fan and duct which serves both units at Electrical Installation Company, Cambridge, Mass. Spray booth and cleaning rack are placed back to back to make this arrangement possible. Savings arise from the fact that one fan does the work of two and space is saved.

169

Raised Ventilator, Saved More Than $400

A 30-in. ventilator extending 10 ft. above the roof operated at about 17 per cent of rated capacity and therefore was unable to keep the area which it served free from fumes. Reason for this low efficiency was the presence of a brick wall, 40 ft. high, about 16 ft. away from the ventilator.

Raising the stack of the ventilator 40 ft. increased delivery to about 75 per cent of rating, and resulted in a saving of more than $400, as compared with the cost of installing a sufficient number of ventilators to handle the same volume of air.

170

To Lessen Condensation

Maintenance of relative humidities between 40 and 60 per cent presents little difficulty in mild weather. When outside temperatures approach or fall below the freezing point, condensation of moisture may cause serious damage to buildings and equipment.

Among the remedies for such conditions are: Use of double sash; proper insulation of walls and roofs

or ceilings; raising the surface temperature, with increased velocity of the air passing over the surface; lowering the humidity as much as permissible.

171

Easier to Meet Schedules

In the manufacture of some kinds of products, pharmaceutical goods for example, advantages other than assurance of uniform quality may result from air conditioning. Cost of processing is reduced because of the uniformity of the materials.

Again, and this is not peculiar to pharmaceutical manufacturing, with standards set up and maintained for manufacturing materials, standard operating practices can be established with assurance that they can be met day in and day out. Schedules, for example, will not depend upon the vagaries of the weather. Performance standards likewise may be established for production machinery even though the relative humidity may have to be low in one department and high in the one next adjacent.

172

Weather's Always Right

Air-conditioning equipment makes conditions just right in the film-processing plant of Consolidated Film Industries, Inc., Fort Lee, N. J., where prints are made from motion-picture negatives for distribution all over the world. Straight process applications are found in the film-drying rooms.

The remainder of the equipment was installed primarily for the comfort and health of employees, but it also pays dividends in the improved processing that results from clean air without extremes of heat or cold, dryness or moisture.

173

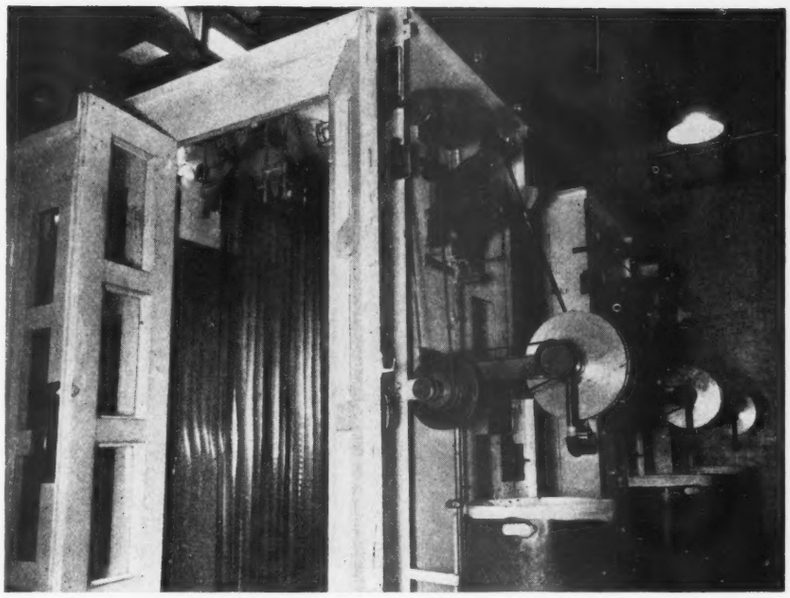
Cuts Absenteesim 56%

Time lost on account of colds and like disorders among employees in an air-conditioned office of one company was 56 per cent less than in another branch office that was not air conditioned.

174

Fumes Can't Reach the Fan

When the fumes from a nitric acid pickling tank were drawn past the exhaust fan located at the outer end of the duct, they attacked the blades so vigorously that frequent replacement was necessary. Of course, maintenance costs were excessive.



Film-drying room at Consolidated Film Industries, Inc., where complete air conditioning (item 172) insures processes, provides real working comfort

The exhaust duct, made of wood, rises vertically for several feet above the tank and then runs horizontally to the outside wall, through which it passes.

Placing the fan in the elbow, level with the horizontal part of the duct, eliminated this trouble. Fresh air from the room is drawn through the fan and discharged through the horizontal section to the outside. Suction created in the vertical section draws the acid fumes up to the fan, which then blows them outside.

175

Cool Workers Produce More

A paper products manufacturer has found that use of portable, pedestal-type fans is very effective in preventing warm-weather slumps in the output of men working around machines that give off large amounts of heat. The cost is trifling, compared to the increase in comfort and production of the workers.

176

Easy with Electric Heat

A combination of steam coils and an electric fan was installed to heat a testing room in which a temperature of 100 deg. F. must be maintained continuously, within 1 degree. Despite the use of a sensitive thermostat to control steam flow, variations in pressure caused trouble.

Replacement of the steam coils with a 4.5-kw. electric heater proved to be the solution. The fan runs continuously, to insure uniform distribution. Using the same thermostat as before, no difficulty is experienced in holding the temperature within 1 deg. of the desired value.

177

Automatic Controls for Best Results

Operation of an air-conditioning system with satisfactory results and maximum economy is hardly possible without automatic control. Manual operation of the various units is possible but seldom, if ever, can operation be adjusted to follow requirements as closely as is possible with the proper control.

178

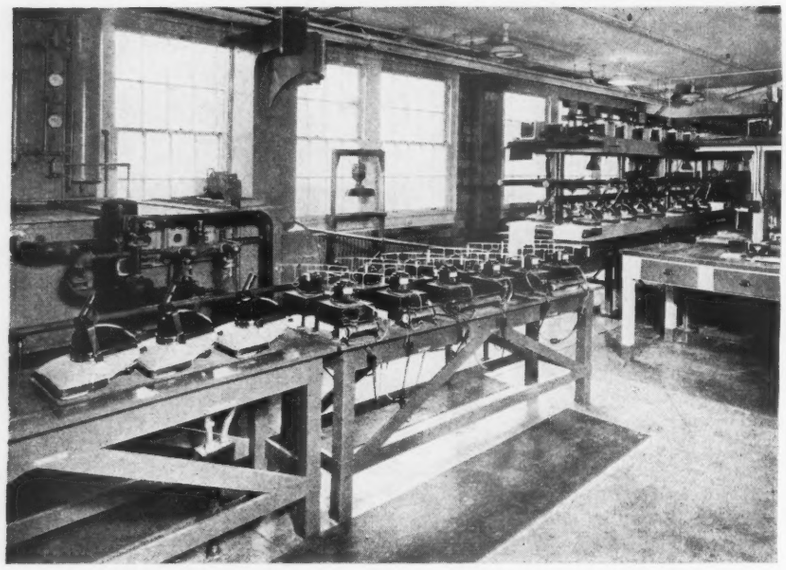
Long Dust Hoods Economical

When a hood is installed to recover dust caused by material falling on a conveyor, it is important that the hood extend far enough to be effective. Depending on the speed of the conveyor, dust will travel for some distance along it. Extension of the hood for that distance will permit removal of the dust with the lowest velocity of air.

179

Heat—at No Extra Cost

It is necessary to ventilate a pipe tunnel in the shipping building of a pharmaceutical manufacturing plant. The air drawn off is warm. But instead of wasting the heat, it is used to warm the refrigerator cars in which



Tests made at constant temperatures (item 180) in The Hoover Company's air-conditioned laboratory insures performance of product in customers' homes

this company's products are shipped in winter.

One end of a large canvas duct fits the vent of the blower. The other end terminates in a sheet-metal elbow, which is inserted in the car through one of the icing hatches. By the time a car is loaded, it and its contents have been thoroughly warmed up—at no extra cost.

180

Air-Conditioned Tests

A temperature of 80 deg. F. with 42 per cent relative humidity is maintained throughout the year in the parts testing laboratory of The Hoover Company, Canton, Ohio, where fluctuating temperatures formerly resulted in variations in the testing of assembly parts for vacuum cleaners.

181

Electric Heat for Office Is Cheaper by Half

A manufacturer solved the problem of heating a shop office by installing a 5-kw., 220-volt electric air heater in the storeroom under the office. The office is at one end of the shop, and to heat it by steam meant overheating the shop.

Warm air from the electric heater is discharged into the office through a register directly over the heater. About 7 ft. away is a second register through which cool air is exhausted to the basement.

The cost of added fuel, if steam alone were used for heating the office, would be about double the amount paid for electric heat. There is also a saving in the labor that formerly was needed to keep steam up during spring and fall when the shop did not need heat.

182

Lost Time Down 87%

At the plant of a tobacco company air conditioning reduced lost-time illnesses of office employees from 75 employees absent one-half day in 75 days to only 5 employees absent in 75 days, during the same period of the year.

183

For Mushrooms, Too

Because successful mushroom growing requires an even, low temperature and relatively high humidity, it's a difficult industry to operate in summer. J. S. Byers, Mt. Pleasant, Pa., can operate his mushroom-growing plant twelve months a year instead of the seven he used to operate before he installed air conditioning.

It costs three baskets of a daily production of more than a hundred to operate the air-conditioning installation, but mushrooms can now be supplied to the summer market when the price is highest.

184

Saves 2 Men's Work, $2,000

Patent leather stored for distribution to shoe and luggage manufacturers was a problem at Colonial Tanning Company, Boston, for it tended to stick together when the temperature went above 85 deg. F. This caused scarring, scratches, and impairment of the finish.

Until the air-conditioning system was installed $2,000 was spent a year in labor cost for two men whose jobs were to turn over and air each hide once in ten days. The 20-ton air-conditioning system installed controls temperature and humidity, eliminates the tendency of the leather to crack.

185

Filtered Air Makes Saving

Optical cement made by Bausch & Lomb Optical Company, Rochester, was occasionally found to have a particle of dust in it, although exposed to the air only 40 seconds during manufacture. This affected its quality.

After treating the surfaces of the room in various ways, without much improvement, a small blower was installed to draw air from the room and the corridor outside and blow it through a felt filter. This treatment removed the dust but liberated small cotton fibers. So a steel wool filter was placed outside the felt filter, and the job was done.

The air-filtering equipment cost $167, but the company makes a monthly saving of several times that amount.

186

Insures Uniform Product

Helms Olympic Bakeries, Los Angeles, have been air conditioned so that the product may be uniform. Temperature and humidity are under perfect control in every part of the plant at all times.

Improved quality was enough to justify the installation, the management said, citing that complaints of bread mold during the summer have been negligible, while the increased cleanliness and employee efficiency made the expense doubly worth while.

187

Ups Its Profits 20%

One operation in the manufacture of coated electrodes for arc welding is the application of a material that serves as a flux and protective covering. It is important that the temperature and humidity be accurately controlled. To maintain the proper atmospheric conditions, one manufacturer has installed an air-conditioning plant.

The freshly coated electrodes are carried into a closed drawing room

on a belt conveyor, and then through an electric oven approximately 60 ft. in length, with thermostatic control of the different heating zones. Moisture required for baking is provided by an automatic spray-type humidifier that delivers conditioned air into the room rather than directly into the oven.

Gross profit has been increased 20 per cent as the result of the close, positive control of atmospheric conditions.

188

Waste Heat Warms Factory And Saves $17,000

Installation of an oil-fired tunnel kiln in a porcelain works solved the problem of heating the plant building, at a saving of $17,000 a year. Waste heat warms fresh air passing through a muffle in the kiln, which is distributed through a system of ducts by three blowers. This heating system has been found adequate even in the coldest weather.

189

Cuts Coal Bill $800

Following the installation of 400 steam traps, the orders for coal in one plant were reduced by $800. Despite this reduction in the amount purchased, consumption was reduced so much that three carloads were left over at the end of the year. It is estimated that these traps save more than twice their original cost, each year.

190

No Specks to Spoil

Because the tiniest fleck of dust can spoil the appearance of its urea-plastic product, an electrical concern set up its 1,500,000-lb. press in an air-conditioned room.

191

Insulation Cuts Heat Loss

Adequate insulation of roofs, particularly on single-story buildings, is one of the most important means of reducing heat losses, and thus cutting heating costs. In the summer it is equally effective in keeping the plant cool.

Some kinds of roof decks, such as heavy wood or gypsum, are inherently good insulators. With others that are poor insulators there may be used insulating boards, usually made from wood, vegetable fiber, or cork. These boards are nailed or applied to the roof deck with hot asphalt, and then protected with a waterproof covering.

192

Betters Plant and Product

Improvement of working conditions was the motivating factor when Apex Hosiery Mills, Philadelphia, installed air conditioning—making the mill a pleasant place to work in summer, and a healthful place in winter.

Quality has been bettered, too, because fog has been eliminated in the dye house, making it possible for the operator to see how much dye he is feeding and thus maintain more uniform color shades. Improved seeing conditions have reduced accident hazards.

Maintenance of motors, conduit, and other equipment has been reduced because corrosion has been eliminated to a great extent.

193

Ups Quality, Cuts Rejects

Rubber gloves for electricians are made at the Wilson Rubber Company, Canton, Ohio, by dipping porcelain forms in the shape of a human hand into tanks containing a very thin solution of rubber dissolved in naphtha. After each dip, the naphtha is allowed to evaporate, which requires several hours. Since about 36 separate dips are needed to produce a glove of the desired thickness, many hours elapse between the first and last dip.

Formerly sudden changes in temperature or humidity often resulted in a large number of defective gloves. Study showed that a temperature of 85 deg. F. with 50 per cent relative humidity was ideal, and that 12 changes of air per hour were needed to remove the naphtha fumes.

Equipment for cooling and circulating 23,000 c.f.m. of outside air was installed. Cooling water of 52 deg. F. is obtained from a well. A separate exhaust system for fume removal was also installed.

Now it is easy to maintain uniform quality of product; a definite production schedule can be kept; and a marked reduction in the number of rejects has resulted in a considerable saving.

194

Thermostats Can Save Heat

Chances are good that thermostatic control of the plant heating system will result in a distinct saving in heating costs, besides giving a uniformity of temperature that is highly conducive both to health and efficiency. With manual control, waste of heat is almost inevitable. The usual tendency is to let the unit heaters or radiators run continuously, and try to regulate the temperature by opening and closing windows.

195

Pressure Keeps Dust Out

When dust must be kept out of testing rooms or other inclosed areas, maintenance of a small, positive pressure within it may be the most economical solution. If outside air is not sufficiently dust-free, air supplied by the fan should be passed through a filter.

196

Heaters Keep Out Cold Air

Much trucking among several one-story buildings at Bendix Products Corporation, South Bend, meant a

(CONTINUED ON PAGE 136)

Wilson Rubber Company, now air-conditioned (item 193), makes better gloves

WINNERS OF THE *Factory* AWARDS

Last May the editors announced 53 *Factory Awards* for the best *Quick Ways to Profits* submitted up to August 15 by employees of the manufacturing industries. Several hundred plant operating men responded with descriptions, not over 300 words long, of specific jobs or plans or installations or ideas that had been used to cut costs in their plants. Names of the 53 winners are given below. Award-winning entries appear in the pages immediately following; they were selected on the basis of savings made, general applicability, and inspirational value.

$100

$100 Award

George R. Worner, Assistant Superintendent, Taylor Instrument Companies, Rochester, N. Y.

$50 Award

I. Morrison, Factory Manager, Morrison Steel Products, Inc., Buffalo

$25 Award

A. C. Sigmon, Plant Engineer, The Dayton Rubber Manufacturing Company, Dayton

$50

15 Awards of $10 Each

Leo Beneze, Superintendent, Electric Maintenance, Owens-Illinois Glass Co., Alton, Ill.; *Charles O. Dalton,* Industrial Engineer, Noblitt-Sparks Industries, Franklin, Ind.; *James H. Eddy,* R. Wallace & Sons Mfg. Co., Wallingford, Conn.; *W. T. Estlick,* Plant Engineer, The Ansonia O. & C. Co., Ansonia, Conn.; *Paul H. Graham,* Production Manager, W. F. Whitney Co., Inc., South Ashburnham, Mass.; *L. A. Haas,* Production Manager, Globe-Wernicke Co., Cincinnati; *Robert W. Hood,* Auditor, Towns & James, Inc., Brooklyn; *George S. Hulse,* Timestudy Engineer. Westinghouse Electric & Mfg. Co., East Pittsburgh; *Frank Leonard,* Foreman, Blacksmith Department, Peerless Mfg. Co., Louisville; *H. W. Linnehan,* Supervisor, New Britain Machine Co., New Britain, Conn.; *Orville F. Long,* Fisher Tennessee Div., General Motors Corp., Memphis; *J. M. Myers,* Power Engineer, E. I. duPont de Nemours & Co., Waynesboro, Va.; *S. N. Selman,* Manager, Fox Chase Knitting Mills, Inc., Rockledge, Pa.; *Robert A. Trumpis,* General Superintendent, Universal Form Clamp Co., Chicago; *Frederick C. Winter,* Industrial Engineer, Thomas & Betts Co., Elizabeth, N. J.

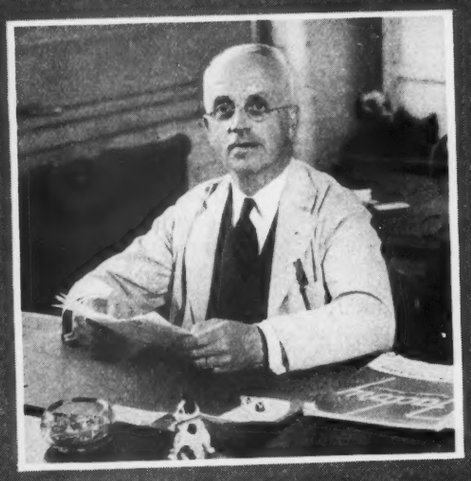
35 Awards of $5 Each

H. W. Benton, Plant Engineer, Pratt & Whitney Division, Niles-Bement-Pond Co., Hartford; *D. G. Bergstrom,* Rate & Cost Reduction Department, Westinghouse Electric & Manufacturing Co., East Pittsburgh; *R. C. Brown,* Advertising and Sales Promotion, The Standard Register Co., Dayton; *Stanley Bykowski,* Foreman, Empire Central Box Corp., Clifton, N. J.; *William Campbell,* Works Manager, T. McAvity & Sons, Ltd., Saint John, N. B.; *Guy C. Close, Jr.,* Timestudy & Estimating Department, United States Aluminum Co., Fairfield, Conn.; *H. R. Conklin,* Assistant to General Manager, Franklin Baker Division, General Foods Corp., Hoboken; *C. E. Cox,* Chief Engineer, Henry Bosch Co., Chicago; *L. N. Davis,* Plant Engineer, Douglas Aircraft Co., Inc., Santa Monica, Calif.; *C. J. Edwards,* Master Mechanic, Utah-Idaho Sugar Co., Chinook, Mont.; *A. F. Erickson,* Works Manager, All-Steel Equipment Co., Aurora, Ill.; *C. F. Erickson,* Production Department, General Electric X-Ray Corp., Chicago; *W. G. Fremont,* De-

CONTINUED ON PAGE 88

$25

GEORGE R. WORNER



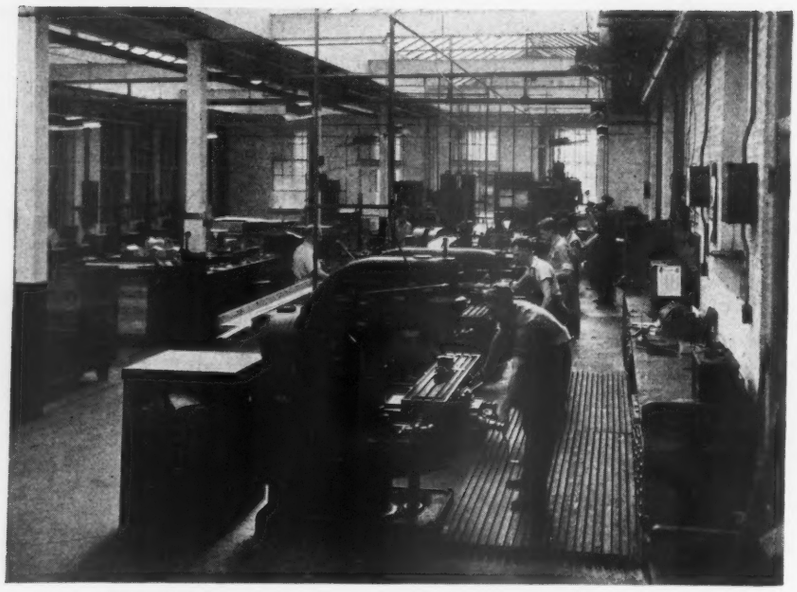
I. MORRISON

A. C. SIGMON

Award Winners

CONTINUED FROM PAGE 86

partment Supervisor, The Standard Register Co., Dayton; *R. N. Goebel*, Industrial Engineer, M. H. Rhodes, Inc., Hartford; *J. W. Goraber*, Cost Accountant, Precision Scientific Co., Chicago; *C. Gunetti*, General Night Foreman, Merco-Nordstrom Valve Co., Berkeley, Calif.; *C. F. Hites*, Production Cost Control Supervisor, The Mills Co., Cleveland; *Fred L. Hull*, Great Western Sugar Co., Loveland, Colo.; *B. R. Johnson*, International Business Machines Corp., Endicott, N. Y.; *W. H. Jones*, Master Mechanic, Pratt & Lambert, Inc., Buffalo; *J. H. Lawrence*, Cost Department, The Raymond Bag Co., Middletown, Ohio; *C. R. Lilgendahl*, Automatic Electric Co., Chicago; *H. W. Lormor*, Works Manager, Willard Storage Battery Co., Cleveland; *R. H. McLeod*, Morris Plains, N. J.; *E. J. Richlik*, Electro-Motive Corp., La Grange, Ill.; *Joseph M. Robins*, Yankee Metal Products Corp., Norwalk, Conn.; *W. S. Whiting, Jr.*, Director of Mechanical Research, Champion Paper & Fibre Co., Canton, N. C.; *Stanley R. Saunders*, Industrial Engineer, American Forging & Socket Co., Pontiac, Mich.; *E. C. Shackelford*, Plant Superintendent, Duncan Coffee Co., Houston; *R. C. Stark*, General Superintendent, Pratt & Lambert, Inc., Buffalo; *S. R. Teranes* and *N. Schroeder*, Hamilton Mfg. Co., Two Rivers, Wis.; *L. B. Thompson*, General Foreman, Maintenance Department, Bendix Products Division, Bendix Aviation Corp., South Bend; *R. Vance Thompson*, Timestudy Department, Basca Mfg. Co., Indianapolis; *Adalbert Voros*, Industrial Engineer, The Bates Mfg. Co., Orange, N. J.; *J. J. Wenner*, Williams Mfg. Co., Portsmouth, Ohio; *C. E. White*, Methods Engineer, Ohmite Mfg. Co., Chicago.



View of tapping and drilling department (item 197) after changes

197

Down Went Costs, But They All Made More Money

A critical survey was made of our drilling and tapping department, and conditions found were characteristic of departments of this kind:

1. Equipment 90 per cent obsolete.
2. Tools more elaborate than necessary.
3. Lubrication, air-ejection, air-cleaning, and clamping facilities much in evidence.
4. Seating facilities improper.
5. Work incorrectly placed.
6. Lack of coordination in the handling of work and machines, to utilize both hands to best advantage.
7. Confusion due to improper location of machines in relation to receiving and delivering work.
8. Operators not equipped with small tools required, necessitating frequent trips to tool vault.
9. Lack of proper grinding equipment; old hand methods used in grinding drills.

As a result of these findings, the following steps were taken:

1. All obsolete equipment was replaced with up-to-date machinery.
2. Tool supervisor reviewed all tools with foreman; simplified and changed them to meet new conditions.
3. Engineering department reviewed all parts drawings to allow wider tolerances where possible, thereby enabling the shop to cut all corners possible.
4. All operations were rechecked by timestudy engineers and suitable standards established.

Here are the results:

1. Floor space laid out more efficiently.
2. Labor costs reduced 50 per cent the first month.
3. At the end of the fifth month 72 per cent of the former labor costs eliminated.
4. Expense item reduced 40 per cent.
5. Deliveries to customers improved.
6. Work in process reduced.

After employees had completed their share of the improvement, a reclassification was made whereby some of the employees were advanced to a better grade of machine work, and earnings of all employees were actually increased after the new set-up had been completed.—*George R. Worner*, Assistant Superintendent, Taylor Instrument Companies, Rochester, N. Y. ($100 Award)

198

Shop Work Cost Cut $12,000

Old-fashioned methods of the one-man plant are still too prevalent. I faced this problem in our steel stamping plant of 140 men when I tried to cut the cost of shop work. Loafing, toilet time, walks to the stockroom and first aid station, materials handling, and other time-consuming activities were, I found, all being charged to

Power truck on the job (item 198) at Morrison Steel Products plant

shop work to the tune of $30,000 annually.

Here's what we did to remedy this waste. Two electric trucks were bought for $5,250. Two men were hired, at a $2,000 annual salary cost for the two, to man these trucks. Foremen were put on weekly salary and held responsible for small stockroom supplies. The rule was made that no man was to leave his job except for toilet and first aid purposes, and time spent thus was to be charged to the job in process.

Result is that cost of shop work was cut to $18,000, including the $2,000 paid to the two truck operators; 17 accidents were cut off the previous year's record by eliminating jay-walking in the plant; 15 men were eliminated from the production payroll; full production time of 8 hr. for each man instead of 1 to 3 hr. charged to shop work on each time card every day.

This amounted to saving the plant nearly $7,000 the first year—after paying for the trucks.—*I. Morrison,* Factory Manager, Morrison Steel Products, Inc., Buffalo. ($50 Award)

199

Improved Power Factor Pays $11,000

After making a study of power rate schedules, we calculated that by purchasing an 80 per cent leading power factor 500-hp. synchronous motor rather than an induction motor, we could get a better rate schedule and save approximately $4,000.

In a short time we had to install three other motors on new equipment, one 500- and two 250-hp. These three synchronous motors raised our plant power factor from 75 per cent to 94 per cent which, under the new rate schedule saved our company $11,075.77 on one year's power bill. The power bill for one year was $102,547.28 whereas the same kw. hr. usage under our old schedule would have cost our company $113,622.85.—*A. C. Sigmon,* Plant Engineer, Dayton Rubber Mfg. Co., Dayton. ($25 Award)

200

11% More Boiler Capacity

Caught in a sudden upturn in the demand for its product, our plant found that orders were being delayed for lack of boiler capacity. To install a new boiler would take too long, so it was decided to equip the four old boilers with automatic combustion control.

While installing this equipment, additional steam was supplied by two locomotives obtained from one of the local railroads. The engines, obsolete but with boilers in fair condition, were drawn up on a side track near the power house and piped to the plant steam header.

When the new controls were complete, net result was an 11 per cent increase in the efficiency of the boilers, and enough additional load could be carried to supply the extra steam for the orders. Four firemen, one from each shift, were no longer needed, and were transferred to other parts of the plant. The installation is expected to pay for itself in about a year.—*J. M. Meyers,* Power Engineer, E. I. du Pont de Nemours & Co., Waynesboro, Va. ($10 Award)

201

Jumped Payroll Efficiency From 75.5 to 99.4%

When the present recession in business was beginning to be felt in our plant, and competition became keener, our vice-president called a foremen's meeting and put it up to us to cut costs and waste, or there would have to be a lay-off.

I knew that many things needed changing, so I suggested that the foremen be allowed to hold two evening meetings a month. They would meet by themselves with no executives present, because I knew they would feel more free to talk on and argue their problems. It was agreed to give the idea a trial.

We have been holding meetings ever since. Much has been done. The foremen understand one another's problems better; there is less friction and buck-passing, and more cooperation all around. We make suggestions for new ideas and improvements, and the front office approves or rejects whatever it thinks it can afford.

A letter from the vice-president to the foremen showed that the payroll efficiency had jumped from 75.5 per cent for the first five months of 1937 to 99.4 per cent for the same period in 1938. He attributed most of this gain to the foremen's meetings—*Frank Leonard,* Foreman, Blacksmith Department, Peerless Manufacturing Corporation, Louisville. ($10 Award)

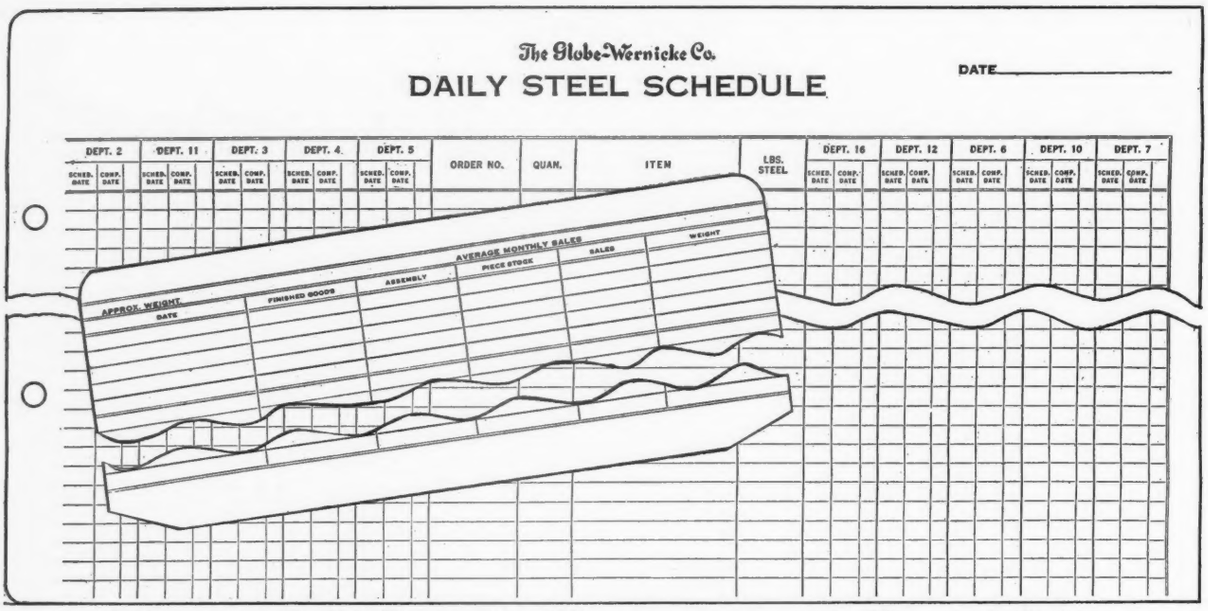
202

Stops Production Jams, So Saves $1,000 a Year

Heaters and motors on a battery of ovens were originally on the same circuit. When a fuse blew, oven production stopped because flow of material into them stopped, although power outage did not seriously affect the heaters for 5 min. or more.

The power circuit was rewired with separate feeders supplied for heaters and motors. A signal circuit was also installed. When a fuse blows, the bell tells the oven attendant a heater has gone out. We call an electrician to renew the fuse. Motors, now on separate feeders, do not stop when a heater does; hence there is no interruption in the flow of material.

Cost of relays, bells, transformers, etc., was approximately $40 per unit for 20 units. Savings based on one



Visible records enable Globe-Wernicke (item 203) to cut process inventories 25 per cent in 90 days

fuse renewal per week per unit have been estimated at $1,000 per year.—*Leo Beneze*, Superintendent, Electrical Maintenance, Owens-Illinois Glass Company, Alton, Ill. ($10 Award)

203

Reduced Inventory 25%

The following system was instrumental in enabling us to reduce our work-in-process inventory approximately 25 per cent within 90 days. We have also found that our-fall-downs on deliveries have been reduced considerably, and service to our customers improved.

Our control consists solely of a set of visible record cards and four progress-record binders, one for each of our lines of manufacture. The cards are especially designed to show the status of finished merchandise, piece part stock, work in process, units of measure, and extensions in steel pounds and board feet sold. The binders depict instantly the progress of all orders in process.

All entries to the binders are posted daily from data received from manufacturing departments. All entries to the cards are made as the work is entered and completed, the sales being posted monthly and extensions calculated.

The control is aided by colored signals used to point out important factors essential in the compilation of weekly shortage charts and departmental loads, and the purchasing of raw materials which is done at 30-day intervals.

Wood cuttings and steel shearings are based on the past month's sales in steel pounds and board feet, from which the schedules for the ensuing month are drawn up. Weekly meetings of the production manager, foremen, and superintendents are held to discuss the progress of schedules and departmental loads.—*L. A. Haas*, Production Manager, Globe-Wernicke Co., Cincinnati. ($10 Award)

204

1 Man for 4, More Work

We have an operation where the edges of rectangular wooden frames 1 x 24 x 48 in. must be painted on the 1-in. edge only. This operation was being done by hand with a brush, and was very slow.

We devised a table with felt-covered rollers whose cupped centers were supplied with paint by an overhead paint container piped to the several rollers. Between these rollers the frame was drawn, the rollers acting like a stamp pad in applying the paint to the frame edge.

Production was increased from 1,000 frames a day, using 4 men with hand brushes, to 1,500 a day, with one man and machine. And a better job is done.—*Orville F. Long*, Fisher Tennessee Division, General Motors Corporation, Memphis, Tenn. ($10 Award)

205

Cuts 80% of the Time from Invoice Writing

Prior to 1937, the cost of entering and invoicing our orders was considered high. Our product is such that we cannot ship more than 50 per cent of our orders from stock. This precluded the idea of writing orders and invoices at the same time, as some concerns do.

We were using fanfold billing machines with continuous-length forms, writing orders first, then billing them after shipment. This meant considerable duplicated effort, for on orders containing several items, each requiring several descriptive words, all typing was repeated when invoicing.

After long study, we tried a duplicating machine. Almost immediately, the possibility of combining orders and invoices into one typing suggested itself. Accordingly, we worked out a master order form on which orders are typed, using duplicator carbon. The 10-part order form is then run through the duplicator machine together with a "strip master."

When an order is shipped complete, we take our master copy and type in date shipped, invoice number, number of cases, route, parcel post, or other charges, still using duplicator carbon; then run the invoice 6-part form through the machine, with the master. The result: Order and invoice at one typing, as against two typings of same information previously.

For partial shipments, the quantities shipped are typed on the "strip master," which is torn off on the perforated line and run superimposed on the original master, with invoice forms through the duplicator. Another "strip master" is made for use with next partial shipment.

This system has reduced carbon cost 30 per cent, and has cut invoicing time almost 80 per cent—*H. W.*

Linnehan, New Britain Machine Co., New Britain, Conn. ($10 Award)

206

Down Goes Cost, Because Employees Know

In our finishing room a trend developed in the last few years toward use of a more expensive type of manufacturing supply for finishing silverware. Use of the new supplies gave a reduction in direct labor cost, but increased cost of the supplies took away part of the gain. This became apparent as more and more of the finishing department's personnel of 50 persons began to use the improved finishing method.

Early this year, when the figures for 1937 came out, it was decided, in conjunction with the finishing foreman, that a drive for the more economical use of supplies might prove very lucrative. The 1937 figures verified the upward trend.

Two tickets were designed and run off on a duplicating machine. On a Monday these tickets were distributed to operators according to class of supplies used. The foreman and his assistant were provided with ticket punches. When an operator asked for a certain supply, the foreman, or his assistant, punched a hole in the proper space on the operator's ticket. The tickets were marked with the operator's name. This procedure was kept up until the end of the week.

In most cases employees were surprised, and no difficulty was encountered in arousing their interest in the elimination of as much waste as possible. Operators showed genuine concern by checking slips with one another.

This weekly procedure has been kept up for four months, with a very perceptible diminution in the use of supplies; the original hope for an annual saving in four figures will in all probability be realized. In addition, an interest has been developed by the 50 employees of the finishing room in the cost of supplies to the company and its indirect effect on them.—*James H. Eddy*, R. Wallace & Sons Mfg. Co., Wallingford, Conn. ($10 Award)

207

Packers on Bonus Inspect

Many companies make separate operations of inspection and packing. We combined the two, set reasonable standards increasing output, and established a bonus plan.

Our products are small electrical fittings that must be visually inspected for component parts, and for quality of the plating. Certain parts of these fittings must be gaged every so many pieces for tolerances.

Fittings are packed in fiber cartons varying in size from 3 x 2 x ½ in. to 6 x 6 x 6 in. Depending upon the fitting size, they are packed from 1 to 50 pieces per carton. The cartons have a flap that is closed by the operator. The operator inserts an inspection slip containing her clock number, and labels the cartons with labels containing the necessary description, catalog number, number of pieces, company name, etc.

This set-up eliminated extra trucking operations between inspection and packing, and a rehandling operation. Also, the separate trucking operation entailed by the labeling of another operator was done away with, and the extra handling that went with it.

A bonus plan assures production within the standards set and rewards the operator's efforts. Our plan is of the type that limits the production to a certain output, which will not cause the operator to slight the visual inspection, as she might on piece work.

This set-up cut costs from one-third to one-half, depending upon the type of fitting.—*Frederick C. Winter*, Industrial Engineer, Thomas & Betts Company, Elizabeth, N. J. ($10 Award)

208

Cut Waste and Seconds to 3%

In one of our mills where we manufacture high-grade braids, cords, and tapes, we experienced considerable difficulty with our silk and rayon during winter months. The rayon and silk would split, causing breakage and marking in the braids. Also, the lint would roll up into little balls and be carried along, making blotches and bad spots at intervals. In real severe weather our seconds and waste in some lines reached a peak of 70 per cent of production.

We realized that air conditioning would help, but the estimated cost seemed prohibitive. So we looked to our heating system. This five-story mill is heated by a hot-air blower system with distributing ducts, and has an air chamber between the heating coils and the fan.

In this air chamber we installed atomizing nozzles. We also installed an instantaneous hot water heater in the water line. This causes a large part of the water to be discharged as vapor at the nozzle tips, and the rest is absorbed by the hot air.

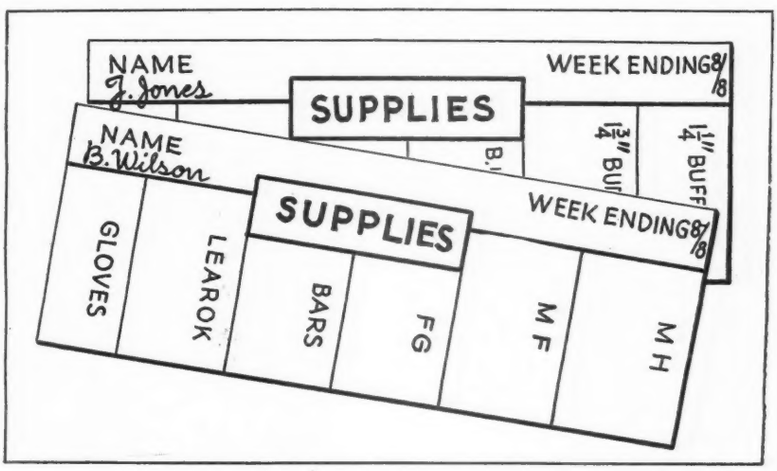
Seconds and waste have been reduced to 3 per cent, and production has been increased 10 to 25 per cent in various lines. Working conditions are better; colds are less frequent, and less time is lost. We consider this installation a real money saver, for we acquired increased production, less imperfect and waste product, and improved working conditions at a cost of about $120.—*W. T. Estlick*, Plant Engineer, The Ansonia O. & C. Co., Ansonia, Conn. ($10 Award)

209

Elevator Saves $2,000

Many manufacturing and wholesale concerns have difficulty in transferring tote pans, trays, and baskets from one floor to another.

Our problem centered around baskets accumulating at one end of our packing department. When we had about 50 of them, stacked in piles and nested one within the other, they were dragged about 20 ft. across the floor to our freight elevator, from which they were deposited on the third floor,



Two tickets (item 206) helped cut cost of supplies in finishing room

where they were to be used.

Here it was necessary for someone else to place the baskets individually on a gravity conveyor leading to our checking department. This operation of returning the baskets involved the use of two people, one on the first and one on the third floor.

Recently we installed a push-bar vertical elevator. Our present operation works as follows: The packer, after taking merchandise out of the basket, puts the empty basket on the push-bar elevator. When the basket is discharged on the third floor gravity conveyor line, it is ready to receive more merchandise and start on another trip to the packing department.

The cost of installing the push-bar elevator was about equal to one year's salary for the two people involved in our former operation. We are now able to use these people for more productive work.

It can readily be seen that with this elevator we have a continuous flow of baskets from packing to checking. As soon as they are empty, they are automatically taken upstairs and reloaded. No time is lost in accumulating them or waiting for freight elevators. The annual saving is at least $2,000 a year.—*Robert W. Hood*, Auditor, Towns & James, Inc., Brooklyn. ($10 Award)

210

Cuts Plating Costs 40%

Plating short lengths of tubing presents many problems, especially to an industry called upon to coat an article it had previously shipped uncoated.

We made all the beginners' mistakes. Our plating job was up to inspection standards, but increased production demands called for more parts than we were able to plate. Increasing the personnel failed to bring proportionate increases in production. Costs went up. From the start, we had trouble getting men to work on the job. The little building housing the operation was known as the "pickle house." Because of the fumes from the lye and acid tanks, it was a nightmare to the workmen.

Bringing the tubes from the fabrication line, putting them on multihook racks, dipping in the various cleaning tanks (lye, water rinse, drying, acid, and neutralizing) was accomplished manually by three operators. Rubber aprons and gloves did not protect the skin and membranes of the nose and throat. This group of operations was the bottle neck of the plating job.

A detailed analysis gave birth to the following solution which in addition to cutting costs on the whole plating job approximately 40 per cent and doubling production, eliminated the hazards.

A part of the building large enough to house the cleaning tanks was isolated from the rest of the working area, and an endless monorail chain conveyor installed. The inspector at the end of the fabrication line hangs the racks on the conveyor, and the operator at the coating furnace removes tubes without moving from his station. Speed of conveyor and length of lye tank are calculated so that tubes remain in solution 3 min. for proper cleaning.—*Charles O. Dalton*, Industrial Engineer, Noblitt-Sparks Industries, Franklin, Ind. ($10 Award)

211

Makes Employees Customer Conscious to Cut Costs

There is a cost that controls costs. I mean the intangible something that is expressed in the wage earner's attitude toward his job. By means of personal contacts and periodical bulletins, we have succeeded in convincing our workers that the customer is the boss. It is the customer who keeps the plant running; it is the customer who supplies the jobs; it is the customer who pays the wages. When the customer is no longer satisfied with the product and refuses to buy it, there will be no plant, no jobs, no wages.

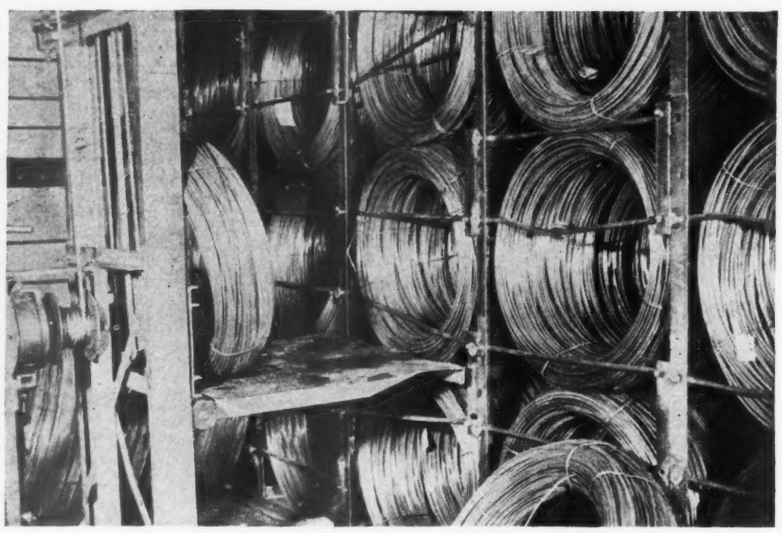
Our workers understand thoroughly what our customers will accept and will not accept. To keep this spirit alive, we keep them fully informed of customers' complaints. Rejected goods are not kept a secret, but are passed around the plant. Every time we speak to an employee about the product we ask the question: "What would the customer say about this?" To keep the employee alert and fully informed of everything new, we buy and distribute reprints of articles in trade journals.

The result has been an interested, alert operator. Defects in raw materials, supplies, and machinery which otherwise would go unnoticed are brought to management's attention. Incalculable savings have been effected by knowing of these defects in time to make claims against our suppliers. Formerly, defective material or parts would find their way into the waste cans, and the best we could do was to increase our waste allowance in our costs. In one year's time we reduced our imperfects by 5 per cent, which in dollars and cents is a considerable sum. Although we haven't changed anything on our cost cards, we have changed our costs.—*S. N. Selman*, Manager, Fox Chase Knitting Mills, Inc., Rockledge, Pa. ($10 Award)

212

20% Less Labor, 50% Less Floor Space

In this shop, which uses bright basic wire in gages from 2/0 to 12 gage, a thorough standardization program was begun which ended in having all coils made up in a specified inside and outside diameter with a specified weight which could be handled by a strong laborer. Then a welded rack was built to permit full storage from floor to ceiling and



Easy to store standard-size coils (item 212) in these welded racks

make sight inventory possible at any time.

The coils are piled on edge five in a row and the rack will take as many rows as the ceiling height permits. Across the loading side ⅝-in. hooked rods are fastened into the framework at set intervals, to keep the coils from falling out.

Loading is accomplished by a high-lift hoist operated by hand. A completely loaded box section will hold approximately 5,000 lb. of wire on a floor area of about 8 sq. ft. On a total of 250 sq. ft. we are now loading over 100,000 lb. of wire with a saving of 20 per cent in labor and 50 per cent of floor space.

The cost of one section is approximately $1.50 for material and $7 for labor, a small amount when you consider the amount of wire 8 sq. ft. will hold.—*Robert A. Trumpis,* General Superintendent, Universal Form Clamp Co., Chicago. ($10 Award)

213

Walking Out, $1,436 Saved

Sorest of all sore thumbs in manufacturing operations are wasteful walking and waiting. While the latter sometimes represents a condition beyond an operator's control, the matter of walking frequently takes on the aspect of diligent activity and goes into the record as a necessary element of operations. As such, it is not regarded as lowering efficiency, which it really does.

As part of a cost-reduction program, we undertook an analysis of a glue-mixing operation. Our first observations, computed on an annual output of 5,000 gal., showed:

Element	*Hours Spent*	*Per Cent*
Walking	622	26
Delay	810	34
Waste Motions	620	26
Productive Motions ...	345	14
	2,397	100

From the analysis, recommendations were adopted to correct:

1. Careless placement of materials which necessitated awkward body motions of walking, bending, and frequent squatting.

2. Inadequate and insufficient equipment which occasioned delay and interrupted work continuity.

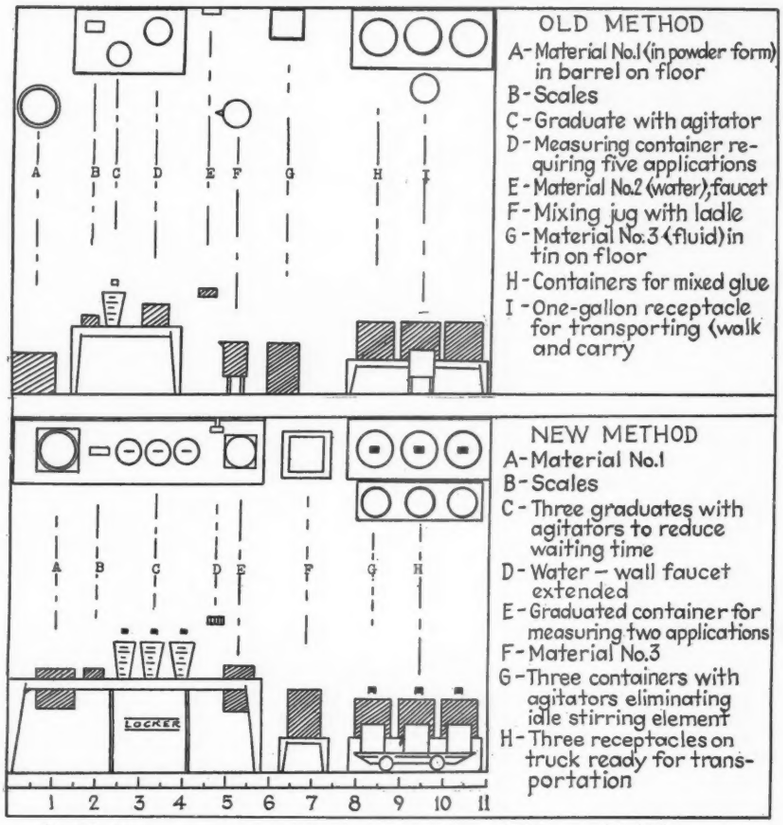
3. Untidy and badly arranged setup of bench and fixtures which militated against rhythmic performance of the work cycle.

The operation was established on a standard time basis, resulting in the following element times:

Element	*Hours Spent*	*Per Cent*
Walking	36	9
Delay*	18	4
Waste Motions	0	0
Productive Motions ...	366	87
	420	100

* Correctible only at unwarranted expense.

The gross saving to the company was $1,596 in direct labor. Cost of changes made was $160, leaving a net saving of $1,436 in the first year.—*George S. Hulse,* Timestudy Engineer, Radio Division, Westinghouse Electric & Manufacturing Co., East Pittsburgh. ($10 Award)


OLD METHOD
A - Material No.1 (in powder form) in barrel on floor
B - Scales
C - Graduate with agitator
D - Measuring container requiring five applications
E - Material No.2 (water); faucet
F - Mixing jug with ladle
G - Material No.3 (fluid) in tin on floor
H - Containers for mixed glue
I - One-gallon receptacle for transporting (walk and carry
A B C D E F G H I
NEW METHOD
A - Material No.1
B - Scales
C - Three graduates with agitators to reduce waiting time
D - Water – wall faucet extended
E - Graduated container for measuring two applications
F - Material No.3
G - Three containers with agitators eliminating idle stirring element
H - Three receptacles on truck ready for transportation
A B C D E F G H
LOCKER
1 2 3 4 5 6 7 8 9 10 11

Simple improvements on this operation (item 213) save $1,436 a year

214

Closer Inventory Control

To control our inventory we installed a tag system of our own design. Tools used for its operation were two tags and a large control board, divided into two main sections.

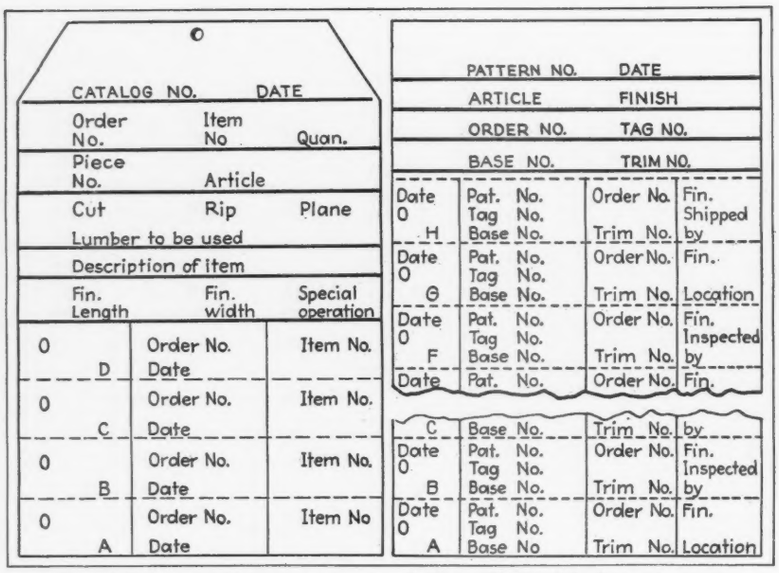
The first section, representing unfinished stock in process, consists of four rows of hooks: (A) Milling, (B) machining, (C) sanding, (D) assembling.

The second section, finished stock in process, consists of eight rows of hooks: (A) White or unfinished storage, (B) staining, (C) finishing, (D) rubbing, (E) trimming, (F) packing, (G) finished storage, (H) shipped merchandise.

The first tag (see figure) is made out for each item on the individual cutting order or work order. The stubs on the bottom are turned in daily, and show, when placed in their proper position on the control board, where the items are, when they were delivered to that location, and what items are lagging and preventing completion of the cutting order.

The second tag (see figure) furnishes more information. When a piece of furniture is completed, one of these tags is fastened to it, and the piece is put into white or unfinished storage to await a finishing order. Stub A, on the board, shows the amount of unfinished stock available. When a finishing order is issued, stub B shows that piece is in finish, and stub A is removed from the board.

This same comparison and removal is carried out along the line. The stubs removed are incorporated into a permanent daily record. Stubs remaining on the board show the exact position of the finished stock in process. This makes for efficiency in inventory control and supplies a check



Close follow-up and inventory control (item 214) with these two tags

on production progress. The efficiency of this system is checked by a physical inventory taken in six-month periods, and the highest discrepancy found thus far has been only 1½ per cent. Most errors show up automatically as the stubs progress. A missing stub calls for immediate investigation and explanation.—*Paul H. Graham,* Production Manager, W. F. Whitney Company, Inc., South Ashburnham, Mass. ($10 Award)

215

Helps You Change Layout

An inexpensive and quick method of figuring out simple layout changes can be accomplished by dividing a piece of heavy Manila drawing paper into two equal parts. Draw your present plant layout to scale in one section. Cut out each machine, work bench, or station with a razor blade, and paste the cutout with rubber cement in the desired location in the second section.

The new layout can thus be arranged to suit your taste. It can readily be compared with the old layout, represented by the blank spaces.

The rubber cement will hold the pieces in place, yet allow them to be taken up and moved at will.—*C. E. White,* Methods Engineer, Ohmite Mfg. Co., Chicago. ($5 Award)

216

No Slopping with This Truck

In a wallpaper plant, as in many other printing plants, large amounts of colored ink have to be mixed and transported. This was done in our plant in a special barrel with a lug on each side, so the barrel could be picked up by trucks after being filled from large storage tanks. Then the truck was wheeled to the printing machines where the color was dipped out with buckets, often spilling on the side of the barrel and the floor. This procedure required several men, and the color was apt to be lumpy.

We therefore designed and built a three-wheel roller-bearing truck holding 55 gal. of color, with a pump and motor located under the tank switch and extension cord.

One man can run this tank with color to the printing machines where the cord is plugged into a receptacle and the short hose on the pump hooked over the color tanks. The pump grinds all lumps and mixes color perfectly. Result: Great saving in labor, better color, and cleaner surroundings. It takes half a minute to empty the tank, and no lifting is required.—*C. E. Cox,* Chief Engineer, Henry Bosch Company, Chicago. ($5 Award)

217

Tote Trays on Wheels

Here is one simple way of cutting handling costs. The illustration speaks for itself. The trays are made of wood and wallboard. They are all uniform in size.

At first, the individual trays were carried from job to job and from department to department by boys. Sometimes a few trays were stacked one on top of another and carried around that way. It was finally decided to build a carrier, on wheels. The trays slide in and out very easily. When the carrier is filled with trays, it is moved into the next department. The trays are pulled out as the work progresses, then put back again into the same carrier and wheeled to the next department. In that way, by using the same trays and the same carrier, the order moves from department to department right into the packing room, after which the empty trays and the carrier go back to the stamping room where all items originate, to begin its circuit around the place once more.—*Joseph M. Robins,* Yankee Metal Products Corp., Norwalk, Conn. ($5 Award)

218

Cuts Entries on Cost Cards

We manufacture several thousand varied parts which go first into subassemblies and then into a complete apparatus.

We use a job order cost system. Formerly, we made daily entries on production orders of elapsed time spent on each job. This, of course, required considerable time and clerical work. Some of the jobs needed ten cost sheets to take care of all the labor time entries.

Recently a new system was installed. Instead of entering labor tickets daily, we file them according to production order number until the job is completed. We then total each man's time tickets and make only a single entry on the cost sheet for each man. In a typical case—a lot of 5,000 parts—four men in four departments worked a total of 106.9 hours over a period of 6 days. Nineteen time tickets were needed, and

Carrier and trays (item 217) cut the cost of handling small parts

under the old system nineteen separate entries had to be made on the cost data card. Now, by totaling each man's tickets, only four entries are made.

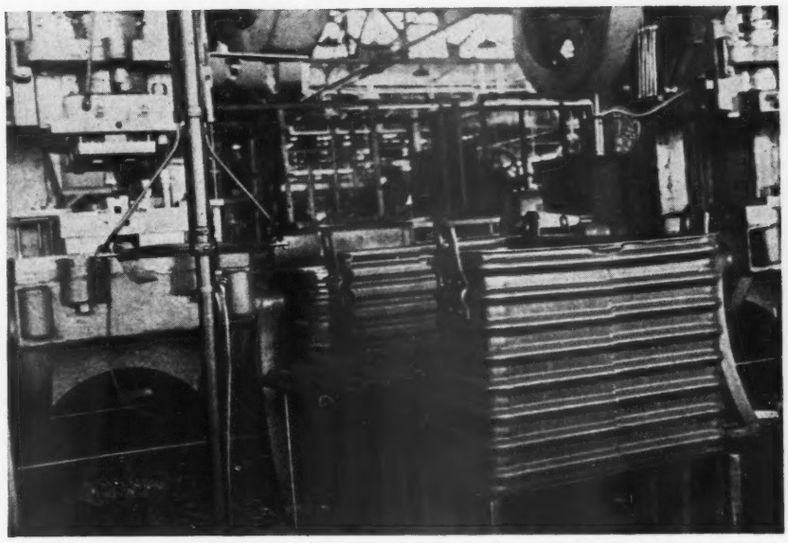
Thus our cost sheets are more condensed, and the information wanted is much easier to spot at a glance. A great deal of time and clerical work is saved, too.—*J. W. Goraber*, Cost Accountant, Precision Scientific Co., Chicago. ($5 Award)

219

Skid Box with Door

When skid boxes were introduced in our plant, it became obvious that operators would have difficulty in removing parts as the supply of parts dwindled in the boxes.

A section was therefore cut out of one side, mounted on hinges, and held in its original position by slide bolts. As level of parts goes down, the bolts can be removed, and the section can be opened to make the rest of the parts more accessible.—*Stanley R. Saunders*, Industrial Engineer, American Forging & Socket Co., Pontiac, Mich. ($5 Award)



Side door (item 219) makes it easy to get at parts in bottom of tote box

220

Increases Capacity 50%

Faced with the problem of increasing production in our assembly department, already nearly filled to capacity with equipment, suggestions were requested for the best method of increasing output. The management had about decided to create a second assembly department in another part of the plant.

Our assembly operations consist chiefly of assembling and spot welding plus some arc and acetylene welding. An analysis had never been made of the department. The management had assumed that to increase production 50 per cent an addition of 50 per cent in equipment would be necessary.

An analysis, which separated "assembly" from "spot welding" showed two operations of which two-thirds of the total time was "assembly" with the spot welder in use only one-third of the time. Revision of these operations increased production through the spot welder by 200 per cent. Of course, not all operations allowed so great an improvement; in fact, some operations could not be altered.

The final result has been to increase production nearly 50 per cent with no additional equipment, except for some assembly benches. Of course, an increase in departmental personnel was nearly proportionate to the increase in production. The decrease in labor cost was slight, but the objective of increased production was accomplished. The money savings will be reflected in accounting for burden.—*R. Vance Thompson*, Timestudy Department, Basca Mfg. Co., Indianapolis. ($5 Award)

221

No Needless Copying

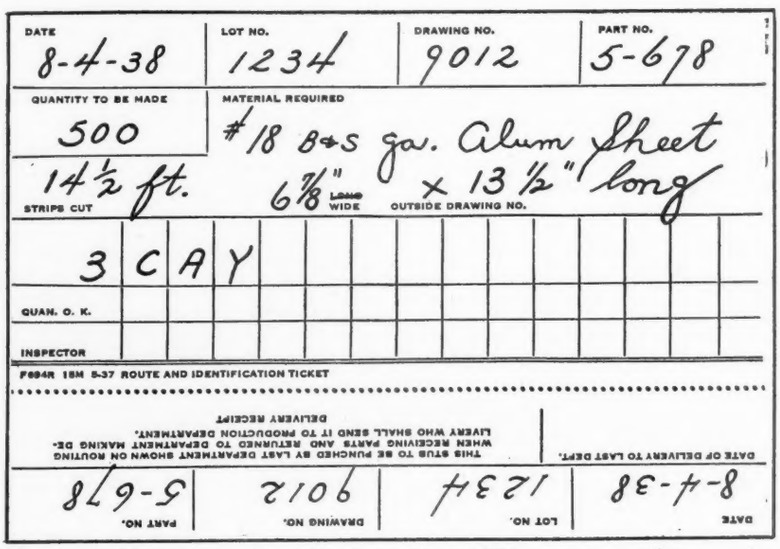
Our production department used to use a route and identification card with a detachable delivery receipt intended for reporting completion of shop work and delivery of parts to the assembly department.

We duplicated some of our work by writing on the delivery receipt the same information found on the card proper; *i.e.*, the date, lot, and drawing and part numbers.

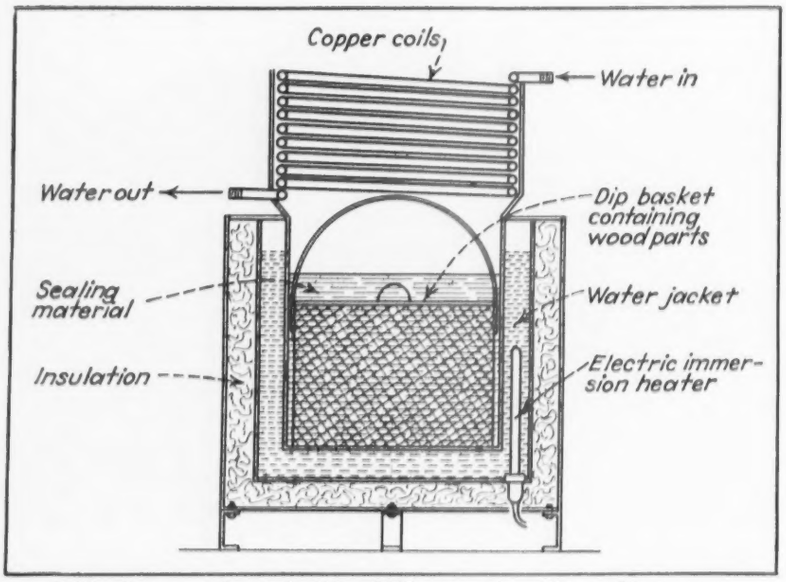
Now we have a revised form that requires only one writing of the details. When we place the route card on the duplicating machine to serve as a master in making out time cards and material requisitions, we put the entire card on the gelatin surface, transferring all information to the gelatin roll. The card is then taken off the roll and turned around. It is rolled over the gelatin just far enough to pick up the top line of the gelatin impression on the delivery receipt.

This type of route card is a saving since it eliminates unnecessary writing and minimizes the errors that might occur in writing the route card and delivery receipt separately.

A time study showed that the time required for writing and check-



They turn this route card upside down (item 221) to save needless copying



Cold coil over sealer tank (item 223) cuts solvent losses 20 per cent

ing information on the delivery receipt on the old form was 13 seconds. Time required for printing delivery receipt on the new form is 3 seconds, during which time the ticket is turned around, placed in the carriage, printed, and removed.—*C. F. Erickson*, Production Department, General Electric X-Ray Corp., Chicago. ($5 Award)

222

Safety Study Saves $500

Our punchpress facilities consist of six presses of the open-back, inclinable type ranging from 25 to 50 tons capacity. All presses operate from foot-treadles and have approved guards. Last November, however, one of the presses repeated and caused an accident. Immediately the methods and the tool-design engineer received instructions to study the situation and install whatever further safeguards would be necessary to insure impossibility of another punchpress accident. Of course, all piecework rates were immediately suspended.

It was decided that the safest way was to keep the operators' hands away from the dies at all times, and we immediately started using tweezers for the insertion of work. After the tweezer had been in use a week, each job was re-timed and a temporary rate put into effect. For the balance of the year, due to the great amount of work passing through, we could do nothing but re-rate the jobs temporarily.

However, after our inventory shutdown, as each job was run again, the methods and the tool-design engineers studied it and noted what type of tweezer would be best suited, and what alterations could be made to the die, to increase production. We immediately installed air hose and cams for air ejection on all our presses.

After our first six months of operation, our records show that 80 individual jobs have been considered, and on these 80 jobs we have effected a net annual saving of slightly over $500 in direct labor. Besides, the morale of the operators has risen, for they have a sense of security that could not be attained if we had continued our hand feeding. It is to be noted that out of the 80 jobs, only 5 cost us more than previously.—*Adalbert Voros*, Industrial Engineer, The Bates Mfg. Co., Orange, N. J. ($5 Award)

223

Cuts Solvent Losses 20%

Many manufacturing processes call for the dipping of parts in heated liquid material having a volatile solvent, flammable or inflammable as the case may be. We had the problem of dipping small wood parts in a liquid sealer that contained a rather expensive, flammable solvent. The parts were placed in a metal basket and immersed in the sealer which was maintained at a temperature of about 140 deg. F. This resulted in excessive loss of the solvent, especially when the basket was moved in and out of the sealing tank.

By placing a cold water coil around the top of the sealer tank, we were able to reduce the quantity of sealing material used about 20 per cent. The cold water coil is arranged to present the largest amount of cooling surface to the solvent vapors, and yet not interfere with the movement of the metal basket. The condensed solvent vapors run back into the sealing liquid.

After the basket has been dipped, it is pulled up into the vicinity of the cooling coils and allowed to drip. Since this is an area of highly concentrated solvent vapors, there is a tendency to clean off the resins adhering to the metal basket and yet not harm the resins which have soaked into the wood pores.

Use of this cold water coil whose operating cost is practically nothing, prevents the solvent vapors from getting into the room. The sealing tank and basket are made of non-ferrous materials, and a ventilating hood acts as an extra precaution. This set-up practically eliminates the fire hazard involved in the operation.—*J. J. Wenner*, Williams Mfg. Co., Portsmouth, Ohio. ($5 Award)

224

Truck with Two Good Tricks

We have a tilting, telescopic electric fork truck designed to handle four to six 450-lb. bales of pulp, 30 by 30 in. base measurement, to and from box car and storage. Two attachments are unusually helpful.

The first is a motor-driven side motion which will shift the forks as a unit 6 in. to either side of center, permitting the load to be handled or "spotted" in very close quarters. This we find indispensable for tiering the bales 14 high in compact even rows.

The second feature is the "jil-poke" bar shown resting on the block between the forks which is very helpful in loading box cars, eliminating the necessity of either blocks or pallets. The truck approaches the load with

the prongs of the bar against the floor but sloping backward so as not to retard the forward motion of the truck. The bar is made of two concentric pieces of pipe with an inner spring which forces the prongs against the floor. As the truck backs up, the prongs dig into the wooden floor and the load is pushed off.—*W. S. Whiting, Jr.*, Director of Mechanical Research, Champion Paper & Fibre Co., Canton, N. C. ($5 Award)

225

No Time Cards, So 5 Men's Work Is Saved

Recording production time on individual job cards is costly. In this plant, the practice of having employees record time in and out on a job card for each job performed required the work of approximately four men per day, averaged 600 to 700 cards.

We have eliminated this non-productive expense by using a time sheet. On one of these sheets the foreman of each department records time, work order numbers, and total hours used each day.

The four men who formerly handled the job cards are now on productive work, and the timekeeper who sorted and balanced job cards as well—a total saving of five non-productive men per day.—*C. F. Hites*, Production Cost Control Supervisor, The Mills Company, Cleveland. ($5 Award)

226

Cuts Waste from 16% to 10

Waste, that insidious destroyer of profits, was making greater and greater inroads in our printing plant until the management decided to do something about it. A determined campaign was therefore begun January 1, attacking waste on three fronts: (1) Waste of materials; (2) waste through errors; (3) waste of time.

The following are the stages in the campaign:

1. A factory committee was organized and educated. Each member was pledged to, in turn, educate his co-workers.

2. Slogan contests were conducted under each of the three waste classifications. Cash prizes went to the winners. The slogans were made into signs and posted throughout the plant.

3. Meetings were held in the company auditorium, at which waste-education programs were presented.

4. Colorful displays were set up in each department calling employees' attention to actual cases of waste and how they could have been avoided.

5. The "Stanreco News," our house organ, publicized the campaign in each issue.

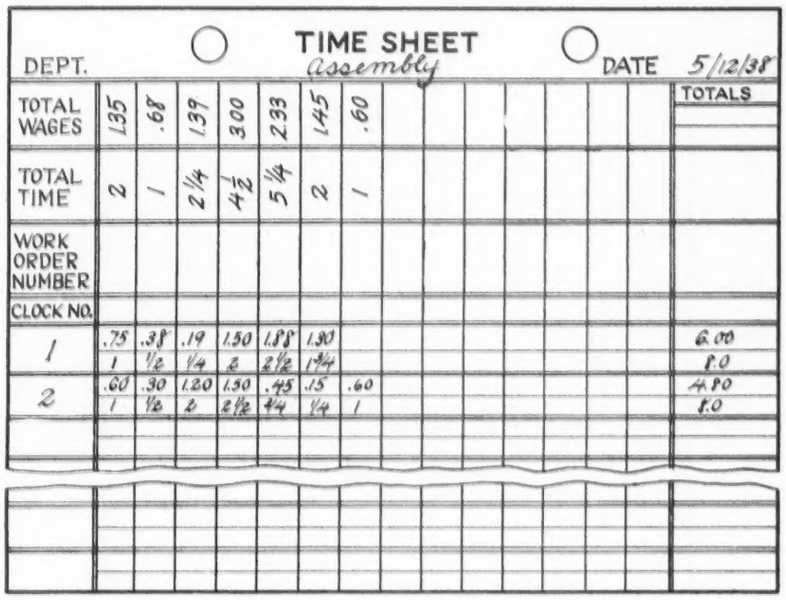
6. Waste caused by errors was publicized on the bulletin boards.

7. Time waste was found to be caused chiefly through employees leaving their posts to secure needed materials. Distraction into other channels was a natural result. To combat this, more than 1⅛ mi. of continuous conveyor was installed, in conjunction with a public address system. Now the material comes to the employee while he remains at his post.

The results:

1. Paper waste alone as of January 1 was 16 per cent. It is now 10 per cent.

2. Actual savings figures are not available with regard to ink, ink rollers, type material, etc., but the management knows that a great reduction has taken place.—*R. C. Brown*. The Standard Register Company, Dayton. ($5 Award)



DEPT. Assembly TIME SHEET DATE 5/12/38

															TOTALS
TOTAL WAGES	135	.68	1.39	3.00	2.33	1.45	.60								
TOTAL TIME	2	1	2¼	4½	5¼	2	1								
WORK ORDER NUMBER															
CLOCK NO.															
1	.75	.38	.19	1.50	1.88	1.30									6.00
	1	½	¼	2	2½	1¾									8.0
2	.60	.30	1.20	1.50	.45	.15	.60								4.80
	1	½	2	2½	¾	¼	1								8.0

Time sheet (item 225) permitted five men to go on productive work

227

Winds 6 Spools at a Time

Our factory has to wind enamel wire on spools in the making of resistance coils. The wire, which is usually enameled copper, size No. 19 to No. 38, may be wound on the coils by either the hand-guiding or semi-automatic method. By semi-automatic is meant that the machine guides the wire to make the proper layers on the spool, but the operator is in complete charge of starting and stopping. It is standard practice to do only one coil at a time, holding the spool on the spindle of a chuck. The chuck is fixed to the driving rod of the motor with a setscrew, the spindle end holding the coil with a wing nut.

I suggested making a chuck that holds six spools on the spindle instead of one. Spools are held securely to the spindle by a wing nut just as the single spool was held.

All that remained to do was to provide six small reels of wire instead of one reel on the stationary shaft from which the wire is unwound to go on the spools. A substantial saving is being realized from the expenditure of $10 for the new chuck.—*C. R. Lilgendahl*, Automatic Electric Company, Chicago. ($5 Award)

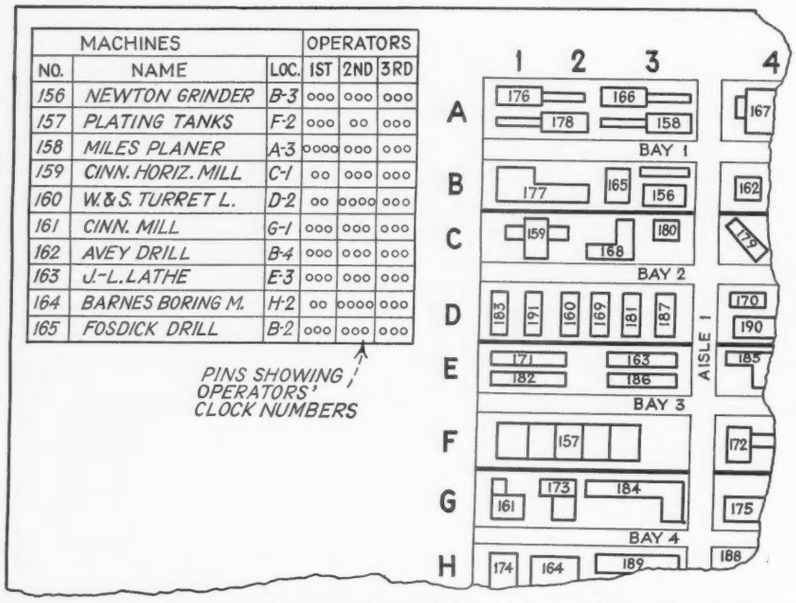
228

Tray Pre-Positions Parts

We handle large quantities of balance wheels, roughly ½-in. in diameter, which are forced on a steel shaft that has tapered ends.

Tote pans were found unsatisfactory for two reasons. First, stockroom clerks found it too convenient to nest the pans, and weight on parts in the bottom pan was sufficient to loosen the wheels from the staffs. Second, parts had to be removed from the pans before assembly, in order to provide a good grasp for the operator.

Trays of wallboard, punched with holes for the staffs to set into, were


MACHINES
NO. NAME LOC. 1ST 2ND 3RD
156 NEWTON GRINDER B-3 ooo ooo ooo
157 PLATING TANKS F-2 ooo oo ooo
158 MILES PLANER A-3 oooo ooo ooo
159 CINN. HORIZ. MILL C-1 oo ooo ooo
160 W.&S. TURRET L. D-2 oo oooo ooo
161 CINN. MILL G-1 ooo ooo ooo
162 AVEY DRILL B-4 ooo ooo ooo
163 J-L. LATHE E-3 ooo ooo ooo
164 BARNES BORING M. H-2 oo oooo ooo
165 FOSDICK DRILL B-2 ooo ooo ooo
OPERATORS
PINS SHOWING OPERATORS' CLOCK NUMBERS
1 2 3 4
A B C D E F G H
BAY 1
BAY 2
BAY 3
BAY 4
AISLE 1
176 178 166 158 167
177 165 156 162
159 168 180 179
183 191 160 169 181 187 170 190
171 182 163 186 185
157 172
161 173 184 175
174 164 189 188

Machine map is aid to maintenance (item 229) at Electro-Motive Corporation

COST SHEET CUSTOMER *WESTON Co.* PART NUMBER *22A-1*

DATE	CORE RM. HRS.	CORE RM. COST	FLOOR FD. HRS.	FLOOR FD. COST	CHIPPING HRS.	CHIPPING COST	FINISHING HRS.	FINISHING COST	INSPECTION HRS.	INSPECTION COST	NET COST	PRODUCT WT.	HEAT TREAT	SHIPPING CHARGE	TOT COS
1938 JAN.	4¼		16¼		2½		3½		½			54#			
FEB.	5¼		17½		2½		5-		½			54#			
MAR.	2		5		½		1½		¼			13½#			
APR.	7-		21½		4½		4¼		¼			54#			
MAY															
JUNE	2½		16¼		1½		3¼		½			40#			
JULY															
AUG.															

Cost sheet (item 230) helps set mark to shoot at on small repeat jobs

tried. These had to be loaded by hand before assembly, and required too much time.

Finally, trays were made of ¼-in. screening, with the frame high enough on each side so that stacking brings no weight on the parts. As the operator drops the finished wheels into the tray, the staffs drop through the large openings. Those not dropping in immediately can be made to by agitating the tray slightly. At assembly, the wheels are found to be practically pre-positioned for a perfect grasp.—*R. N. Goebel*, Industrial Engineer, M. H. Rhodes, Inc., Hartford. ($5 Award)

229

Map Speeds Maintenance

During a period of plant expansion, when new machines were being installed every day, it became difficult for us to be sure that each machine was properly manned on all shifts. The solution we decided upon was to paste a layout of the department on cardboard and hang it on the wall. Then we obtained tacks with numbers on their heads, and these were arranged in proper sequence on the layout to form the men's clock numbers opposite the machine they were to work on. A glance at the chart then told which machines were idle, and we could immediately inform the employment department that we needed a man to operate a certain machine.

Because the chart was found useful for other purposes, it was redrawn and modified until it took the final form as shown. For instance, it was found that scrapped work could be traced by noting the machine number in the scrap pan and then finding the shift and man's number on the chart.

The idea of using letters and numbers to locate the machines on the chart was adopted to simplify the directing of maintenance men to the proper machines. Before, if an electrician came along with an order to wire machine No. 162, it was necessary to give him long, detailed directions where to find it. Now we merely locate the machine on the list, find its location on the chart (in this case B-4) and then tell the man that it is in Bay 1, Aisle 1. All in all, and in its final form, this chart has proved a very useful accessory to our department.—*E. J. Richlik*, Electro-Motive Corp., La Grange, Ill. ($5 Award)

230

Cost Sheet Helps Set Mark To Shoot At

Even though quantity of production is too small to warrant a methods and time study, it is imperative to know how much time must be spent on a job. In a foundry, for example, many jobs come in only once, some periodically, yet it is necessary to have some idea of the time that should be spent on a particular job.

Past records are useful in solving this problem. A foreman who views 50 different jobs every day cannot remember time spent on a job done two months back. The cost sheet shown here gives the kind of information wanted. We find that for 54 lb. of castings, which our job order card may reveal as four units, we have unit times that vary considerably. By selecting a unit time for each department recorded in a period when shop activity was normal we have a figure that the foreman can shoot at.

This information, indexed where all foremen may consult it, will help to standardize job times.—*Guy C. Close, Jr.*, Timestudy & Estimating Department, United States Aluminum Co., Fairfield, Conn. ($5 Award)

231

Barrel Truck Saves Backs

In the manufacture of our pigment products, we grind various pigments separately in standard liquids in paste consistency. These pastes are later combined with various liquids to make finished paints and enamels.

Many pastes are used in large quantities and are carried in stock in open-head steel barrels. Our larger mixing tanks are in fixed locations, and it is difficult to move the barrels of paste to these mixing tanks without first putting a cover on the barrel and bolting this cover in place so that the barrel can be tipped over and rolled to location.

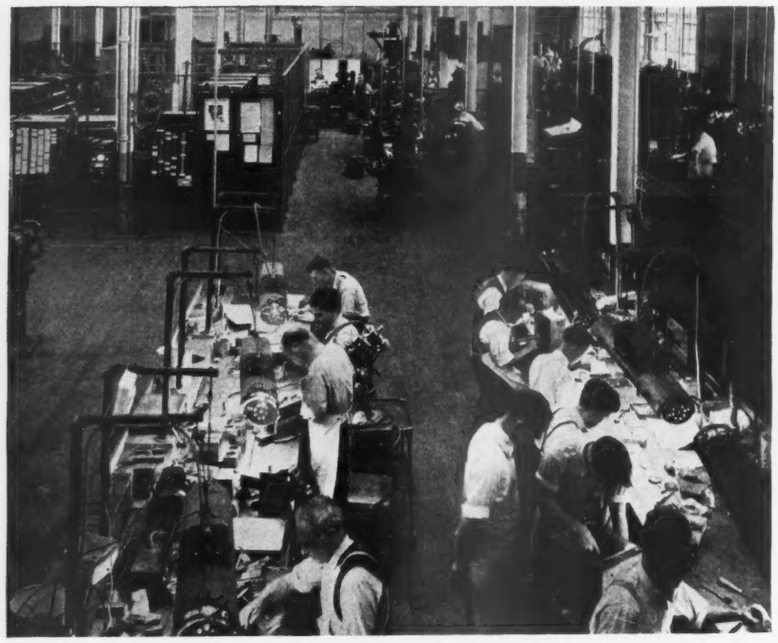
A short time ago we worked out a 3-wheeled barrel truck, which enables us to move the barrels of paste without putting on the cover.

A trunnion clamp ring is first

(CONTINUED ON PAGE 140)

BUILDINGS AND SERVICES

5



Tooling department at General Electric's plastics division (item 232). Fuel bills were cut 31 per cent, water bills lowered, maintenance costs reduced

232

Process Heat Cost Off 31%

Large savings have been made by the use of water under high pressure and temperature for heating molds in the new plastics division plant of the General Electric Company, at Pittsfield, Mass. Fuel costs have been reduced about 31 per cent as compared with the former steam heating installation in the old plant. In addition, water bills have been reduced, while fewer boiler blowdowns and less maintenance are needed.

After a week-end shutdown, the equipment can be brought up to working temperature in about half the time formerly required.

233

After-Cooler Cuts Costs

Compressors in the plant of a machine tool manufacturer were in such poor condition that it was difficult to maintain the desired pressure of 60 lb. per square inch.

New compressors that were installed easily kept a pressure of 100 lb. but in the absence of an after-cooler, which had been omitted in order to keep the investment down, much trouble was experienced with water in the air lines. Many air-driven tools are used in this plant, and the presence of moisture in the compressed air lines caused high maintenance costs and considerable spoilage of work.

Installation of an after-cooler completely eliminated trouble with moisture. It is estimated that the saving in maintenance alone on the air-driven tools was sufficient to pay for the after-cooler in a few months.

234

Clean Floors, $1,250 Saved

Former practice in a metal-working plant was to detail a crew of fifteen men to scrub the floors every Saturday. Five hours' time was allowed to do the work. Frequently certain areas had to be left undone in view of the limited length of time allowed for the work. Since the work was done on overtime, the hourly rate was $1.12, representing a cost of $84 for 75 manhours of scrubbing.

Use of a combination floor-scrubbing, rinsing, and drying machine has made it possible for a two-man crew to scrub the entire 50,000 sq.ft. of floor area at the regular night work rate of 75¢ an hour. Therefore, a better job of cleaning is being done at a saving of $24 a week or approximately $1,250 a year.

235

Thin Cement Waterproofs Brick Wall

At the plant of an oil company a brick wall became so saturated during a prolonged wet spell that the moisture was transmitted to the interior of the building. After the wall had dried out, a repetition of the trouble was prevented by spraying the exterior surface with a thin mixture of portland cement and water (about 1 part of cement to 3 parts of water), under an air pressure of 90 lb. per square inch.

236

Felt Stops Glass Breakage

A complete cure for breakage of glass in doors due to slamming or bumping was found in the use of the standard ¼-in. channel felts placed around the glass in automobile doors. This channel felt is purchased in standard lengths and fitted around the glass in double-swing doors, using suitable wood molding to hold the glass and felt in place.

237

Only Half as Much Steam

A concern that buys process steam used pounds of steam per pound of product as a yardstick, found such wide variations for its thirteen pay months that a campaign was inaugurated to reduce wastes. Preventable wastes were found to include: (1) Lack of insulation; (2) poorly installed insulation; (3) leaky pipe threads; (4) leaky valves; (5) failure to detect and repair leaks; (6) waterlogging and air binding.

Attacks from these six angles reduced by half the steam consumed per pound of product.

238

Saves Roof Repair Bills

Before a new roof covering is laid it is important to make sure that the deck and roof structure are in good condition. Inspect and renew flashings if necessary, correct imperfect drainage, and eliminate low places. Attention to such details will save repair bills later on.

239

Re-Use of Water Cuts Cost

To prevent former waste, water used in cooling rubber mills in one plant is now passed through the ammonia condenser of the ice machine. Then, containing the heat absorbed from these operations, it goes to the salvage water tanks from which it is pumped to the boiler make-up tank, or to another department that requires warm water.

Automatic regulating valves on the ice machine condenser give a further saving because they are set to maintain the most economical combination of power and water costs. Cooling

water for the air compressor is handled in similar fashion.

The net result is a large saving in water, along with heat units that used to be wasted.

240

Steam Serves as Yardstick

By finding the ratio of pounds of steam to pounds of product, American Hard Rubber Company, Butler, N. J., has a convenient yardstick by which to budget service costs. For example, if forecasts anticipate the processing of, say, 200,000 lb. of material, the cost of steam can be determined within a few per cent of actual requirements.

241

Floor Cleaner Pays Out in Year

Concrete floors in the machine shop of a metalworking plant soon become coated with a hard crust composed of dirt, metal chips, and oil. Formerly it was the practice to have a crew of three men equipped with scrapers and brushes go over the machine shop several times a year. About four days were required for each cleaning. The annual cost amounted to about $575.

After a double-brush floor cleaning machine fitted with scarifying brushes had been put into service, it was found that the machine shop floor can be gone over by two men in one day. With the same number of cleanings per year as formerly, the annual cost is somewhat less than $100, representing a saving of about $475.

At this rate the floor machine paid for itself in considerably less than a year.

242

Still Good After 10 Years

After more than 10 years of service in the plant of Chas. Bach Company, San Francisco, during which it has been subjected to very heavy trucking, no repairs have been needed by a fiberized mastic floor covering. It is considered still to be in practically perfect condition.

243

No Maintenance in 2 Years

A pulp mill formerly used 24-in. wooden troughs for conveying cellulose material in the presence of chlorine in water solution. Repairs were frequently required, and troughs had to be replaced every three years.

An installation comprising 300 ft. of 16-in. rubber-lined pipe replaced the wooden troughs and has been in service for more than two years. During this period no maintenance has been necessary and on the basis of the length of service given by other, similar installations the life will be indefinite. In addition, carrying capacity of the pipe is greater than that of the old trough.

244

Sprinkler Saves $9,900

Because its plant was not sprinkler-equipped, a firm found that it stood to lose $32,484 over a 10-year period. Excess insurance premiums that would not have to be paid if sprinklers were installed, and the interest on this money, were the basis of this figure.

Sprinklers were installed. Deducting cost of the installation from the amount it stands to save in insurance premiums, and figuring interest, the company estimates that it will be $9,900 ahead in ten years.

245

Welding Saves Engine Base

When the base of a 100-hp. diesel engine was fractured by the pounding of a loose journal box the owners learned that a new base would cost $1,200 plus freight charges.

It was decided to repair the damage by bronze welding, with the oxyacetylene flame. With this method the engine base was made as good as new for a comparatively few dollars.

246

Oxygen Lance Saves $8,000

In the foundry of a southern manufacturer about 15 tons of metal froze in the cupola. Approximately half of the metal was inside, while the remainder extended from the cupola to the ground.

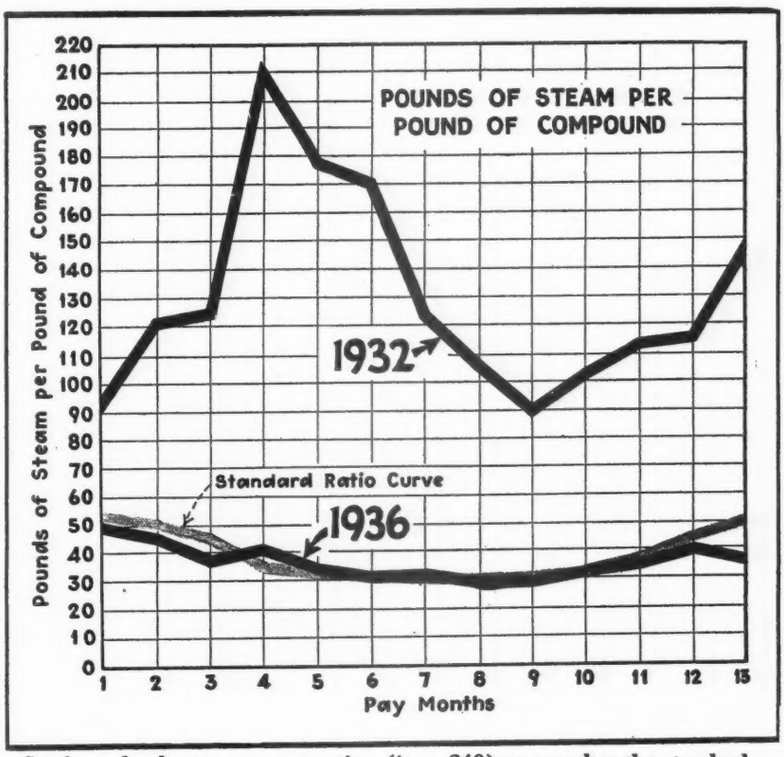
It resisted all attempts to move it, until an oxygen lance was put to work. With its aid the entire mass was removed in about a day and a half. The cupola is worth $8,000 and was put back in service, unharmed, at a cost of $125 for labor and material.

247

New Boiler Saves $10,200

When it became necessary to increase the capacity of the boiler plant serving the Imperial Laundry Company, Newark, a high-efficiency, high-capacity type boiler with air preheater was installed. It is fired with pulverized coal.

Ability to burn slack coal, instead of the lump grade formerly required, reduced fuel costs about 30 per cent. In addition, more economical genera-



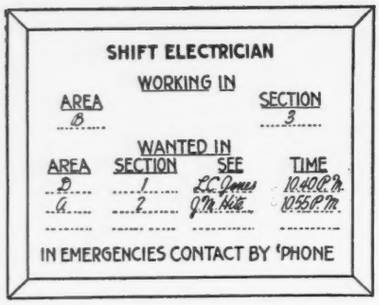
See how closely steam consumption (item 240) approaches the standard

tion and usage of steam and hot water have cut the daily consumption of coal from 10 tons to 8. The total yearly saving in fuel costs is about $10,200.

248

Tells Where Electrician Is

Before going on a job the electrician in one large plant writes his destination on a call board in the electrical shop. If he is absent when called on the telephone, a man from the area or section needing his services goes to the electrical shop and either marks the call on the board or, if an emergency exists, gets in touch



with the electrician by telephoning or going to the section in which he is working.

After completing a job the electrician returns to the shop, and if new calls are on the board finds out by telephoning or from notes left on his bench just what has gone wrong. This information enables him to judge the relative importance of various troubles and determine the tools and supplies needed. If two or more jobs are of equal importance, the earlier call, as indicated by the time marked on the board, receives attention first.

249

Boiler Meters Save $20,000

An installation of nineteen distribution meters in the plant of a large soap manufacturer saved $20,000 during the first year. This saving was brought about by flattening out peak loads, which in turn made it possible to meet plant demands for steam with one boiler, instead of keeping a second boiler in service or banked ready for use.

250

Laid One Day, Used Next

Quick-hardening cement saved the Blumer Brewing Company, Morrison, Wis., a serious delay when it became necessary to lay a new floor in the rack house. The old cement floor had been badly broken by allowing steel barrels that weigh as much as 200 lb. apiece to drop on the floor on their edges.

Work of removing the old floor was started at noon, and a quick-hardening cement was used for the new floor, which was laid that afternoon. Racking was started at noon the next day. Barrels were dropped on edge as usual, without harming the new floor.

251

Boosts Plant Efficiency

A foundry generates its own power and formerly operated an old steam-driven compressor. Castings were being tumbled, but the load on the motor driving the tumblers became so great that a larger generating plant and new wiring were needed. All this meant a heavy investment.

Eventually a high-efficiency, two-stage air compressor having built-in motor was installed, with a pipe-line-type after-cooler. A sandblasting outfit replaced the tumblers. As a result the electrical load was reduced so much that it could easily be handled by the existing generating plant and wiring, power factor was raised from 64 to 92 per cent, and there was a saving in coal of 3 tons a day.

Water in the air lines, which formerly caused much expense and annoyance, was entirely eliminated.

252

Needs 13% Less Power

A saving of 13 per cent in the horsepower required for operation was made by replacing two old pumps in the plant of Mead Johnson & Company, Evansville, manufacturers of infants' foods.

The old pumps had an efficiency of 74 per cent. In their place was installed a larger pump with an efficiency of 85 per cent. The resultant saving in horsepower amounts to 13 per cent.

253

Meets All Air Demands

When additions were made to the plant of Akron-Selle Company, Akron, it was found that the old air compressor could not handle the added requirements. Cost of a new unit having the needed capacity would have been several thousand dollars.

As an alternative a small unit costing about $300 was installed. It reduces the load on the large unit by supplying all the compressed air needed by one section of the plant. During periods when the entire plant is not operating, the small compressor is able to meet all demands and the large unit is shut down.

254

Saves Telephone Time

A simple signal system for indicating when important executives are away from the plant will save much time uselessly spent in trying to locate them when they are wanted on the telephone.

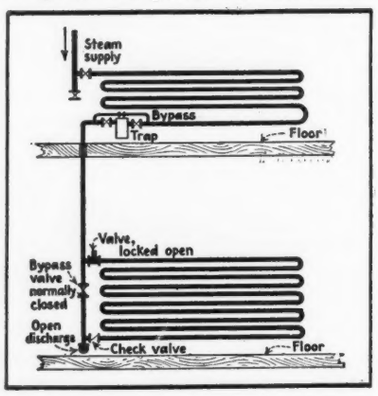
It comprises a lamp-type annunciator placed near the telephone switchboard, with a toggle switch cabinet at the information desk or main gatehouse. When one of the persons listed leaves the plant during working hours the watchman or clerk flips the proper switch and the corresponding lamp in the annunciator lights up.

If a telephone or other call comes in for this person, a glance at the annunciator tells the operator that he is not in.

255

Best Use of Process Steam

More effective use is made of process steam by locating hot water coils below steam coils. To make it foolproof and prevent someone from



shutting off the lower coil, thereby plugging up both steam and hot water coils, the supply valve to the latter is locked open. A valve that bypasses it is normally closed, thus forcing the hot water to circulate through the coil. If this bypass valve is opened, the water is merely sent directly outdoors without affecting the steam coil in the processing department.

256

Six New Pumps Save $3,700

Seven old pumps in a large paper mill were replaced with six new ones of the latest design. The old pumps required 320 hp., whereas the new

ones need only 159 hp., about half as much. It is estimated that each horsepower saved amounts to $23; therefore the saving of 161 hp. represents $3,700 a year. At this rate the new pumps will pay their cost in less than 1½ years.

257

Keeps Out Rust and Slime

Spray heads, lines, and condensing tubes of the ice machine in a meat-packing plant became so coated with rust that they operated at only 60 per cent efficiency. Specifically, head pressure dropped from 206 lb. to 162 lb. Complete removal of the rust was achieved in two hours by substituting for some of the water in the system a solution of an acidic material compounded so as to have no effect on the sound surfaces with which it comes in contact. The system was then rinsed by circulating plain water, followed by circulation of an alkaline material to assure complete neutralization of the acid material first used.

To avoid future trouble, the water in the circulating system now carries a low concentration of a material designed to prevent formation of rust and also to control algae, slime, and similar insulating deposits.

258

It's All Put on the Air

A suitably designed public-address system can be made to save time as well as entertain workers and relieve fatigue. In the plant of Hygrade Sylvania Corporation, Salem, Mass., such a system serves to give signals for starting and stopping work; convey any announcements the management wants to make; sound code signals to call executives to the telephone; summon the watchman after hours; and entertain the operators with music or news.

259

Hardener Improves Floors

Non-dusting concrete floors can be had by applying a hardener which fills the pores and keeps oils, grease, and other staining materials from entering the finish. It's applied with a long-handled brush.

260

$1,800 Less for Water

Cost of city water required by a large plant averaged about $3,200 yearly. After an investigation had shown that good-quality water was available on the property, a well was sunk and a deep-well turbine pump installed. The total cost was $3,500.

Allowing for interest on the investment, depreciation, and maintenance and operating costs, the average annual cost for well water is now about $1,400, thus showing a saving of about $1,800 a year.

Incidental benefits lie in the fact that the well water is cooler and has a lower content of mineral salts than the city supply.

Public address system at Hygrade Sylvania Corporation (item 258) is used to make announcements, also to entertain the operators with music or news

261

Whitewash from Waste

Carbide residue from acetylene generators is really a high-grade slaked lime that can be used to good advantage in making whitewash, mortar, or plaster. It may also be used to soak up oil from floors and, in combination with asbestos fiber and sawdust, as a heat-insulating material for boilers and other equipment.

262

Float Valve Protects

To guard against water hammer or surge, a large chemical plant has surge tanks located at a proper elevation to produce the necessary hydraulic head. Constant head is required for certain delicate glass apparatus that may be destroyed, with a loss of several thousand dollars, if there is excessive head or water hammer.

On one occasion hammer caused $2,000 damage; then a float-operated valve was installed to control surge tank water level, and the danger of similar damage has been eliminated.

263

Steam Booster Saves $70

In a midwest plant the main steam supply is generated at 150 lb. per sq. in., but it was necessary to operate a small oil-fired boiler to supply about 2,000 lb. of steam an hour at 225-lb. pressure.

A steam booster now takes steam at 150-lb. pressure and delivers it at 225-lb. pressure at a net saving of $70 a month over the cost of operating the oil-fired boiler, which was discarded.

264

Calls Cranes by Phone

Telephones installed in the operators' cabs of overhead cranes used in the warehouse of a lumber company have speeded up handling of orders. From his desk the shipping clerk can call a crane operator to give him instructions, regardless of where the crane is working.

265

More Water, Less Power

Turbine pumps deliver twice as much water with half the power required by the old air lift system

in a large knitting mill at La Perfeccionada, S. A., Mexico. The pumps draw water from 20 ft. underground and lift it to a reinforced concrete tank 40 ft. above ground. From the tank, water flows by gravity to different points in the block-square plant.

266

Booster Compressor Knocks $691 from Power Bill

A booster compressor to take care of peak loads saved Foremost Dairies, Inc., of Jacksonville, Fla., $691 on its power bill in 1937. Prior to its installation there was a problem of handling peak loads and constant load without expenditure of excessive horsepower.

Two compressors, a 9x9-in. two-cylinder, vertical, inclosed machine and a 7½x7½-in. two-cylinder machine of the same type, had more than enough capacity to handle peak loads, and power was being wasted in running them. Now the 9x9-in. and the 7¾x5-in. booster handle peaks, while during periods of light load the 7½x 7½-in. unit and the booster carry on.

267

Hardened Concrete Lasts

Under the severe services to which it was subjected, the concrete floor of a shipping platform became worn and gouged out to a depth of approximately 6 in. Much of the damage was caused by allowing iron drums and cylinders weighing about 500 lb. each to drop heavily on it. Repairs made with ordinary cement lasted about two months.

Some time ago another patch was put in, but the cement was mixed with the recommended quantity of a hardening material. After two months of the same service to which the floor is always subjected the new patch showed no signs of cracking or wear.

268

Extinguisher Record Pays

In order to keep track of the soda-acid and foam extinguishers in one plant, and have a record of the charges, each extinguisher and location is numbered. When a discharged extinguisher comes to the plumbing shop for recharging, it is recorded in a book under its own number and a recharged extinguisher is given out, after exchanging caps so that the numbered cap always goes back to the same location. This record eliminates the necessity of waiting for the extinguisher to be recharged, and also keeps the equipment available at all times. Two or three extra extinguishers are kept on hand, fully charged and ready to be given out after the caps have been changed.

A complete record is kept for each extinguisher showing, among other things, the date when it was last charged, so that the inspector can determine from the record the status of every extinguisher. This system also provides a basis for calling in certain extinguishers for recharging, following the expiration date of one year. It is simple and has proved its effectiveness over a considerable period.

When one considers that a 2½-gal. foam charge costs about $1.25 and a 5-gal. charge about $2.15, a record such as this pays for itself in that extinguishers are kept in service for the full twelve months allowed by the Underwriters before compulsory discharge.

269

Calking Saves Heat

Calking around doors and window frames plays the important role of keeping out cold drafts and rain. Failure in the first instance will be reflected in higher heating costs and shivery, uncomfortable workers. Entrance of water will almost certainly result in serious damage to the structure, possibly injury to equipment.

Cost of properly maintaining calking is trifling compared with the trouble and expense it will save.

270

Paint Keeps Plant Cooler

Cost of operating and maintaining the air-conditioning equipment in a cold storage warehouse led to an investigation of ways to cut costs. Eventually it was found that the use of an aluminum, light-reflective roof finish lowered the interior temperature so much that a considerable part of the equipment could be shut down.

An incidental, but important, advantage was found to lie in longer life of the roof coating brought about by the light-reflective properties of the finish.

271

Water Saves Fuel

In the plant of Synthane Corporation, Oaks, Pa., manufacturers of laminated plastics, hot water under high pressure has replaced steam for heating ovens, presses, and other equipment at a substantial saving in fuel cost. With the system used here, water heated to a high temperature is circulated in a closed system from the boilers through the different kinds of equipment and returns to the boilers for reheating.

Added to the saving in fuel are lower maintenance costs, more uniform pressure under certain peak loads, and cleaner boilers.

272

Presses Kept on Working

It became necessary to replace the cement floor around a number of presses in the plant of the Simmons Co., Linden, N. J. These presses were being operated 24 hours a day and it was essential that there be no interference with production.

To meet these conditions, temporary bridging was built and attached to the large presses in such manner that it spanned the section where new cement was to be put in. Thus the press operators were able to continue work while repairs were being made.

The new sections of floor were laid on Friday, a quick-hardening cement being used. The next morning the floor was hard enough to be subjected to normal usage.

273

Last Half as Long Again

Frequent repainting, with consequent interruption of operations, was formerly necessary in a cannery because the combination of steam and vapors always present in the air favored the rapid growth of fungi on the interior walls and ceilings.

After complete repainting with an anti-fungus paint it was found that fungus growth was greatly retarded, and that surfaces remained in good condition 50 per cent longer than formerly.

274

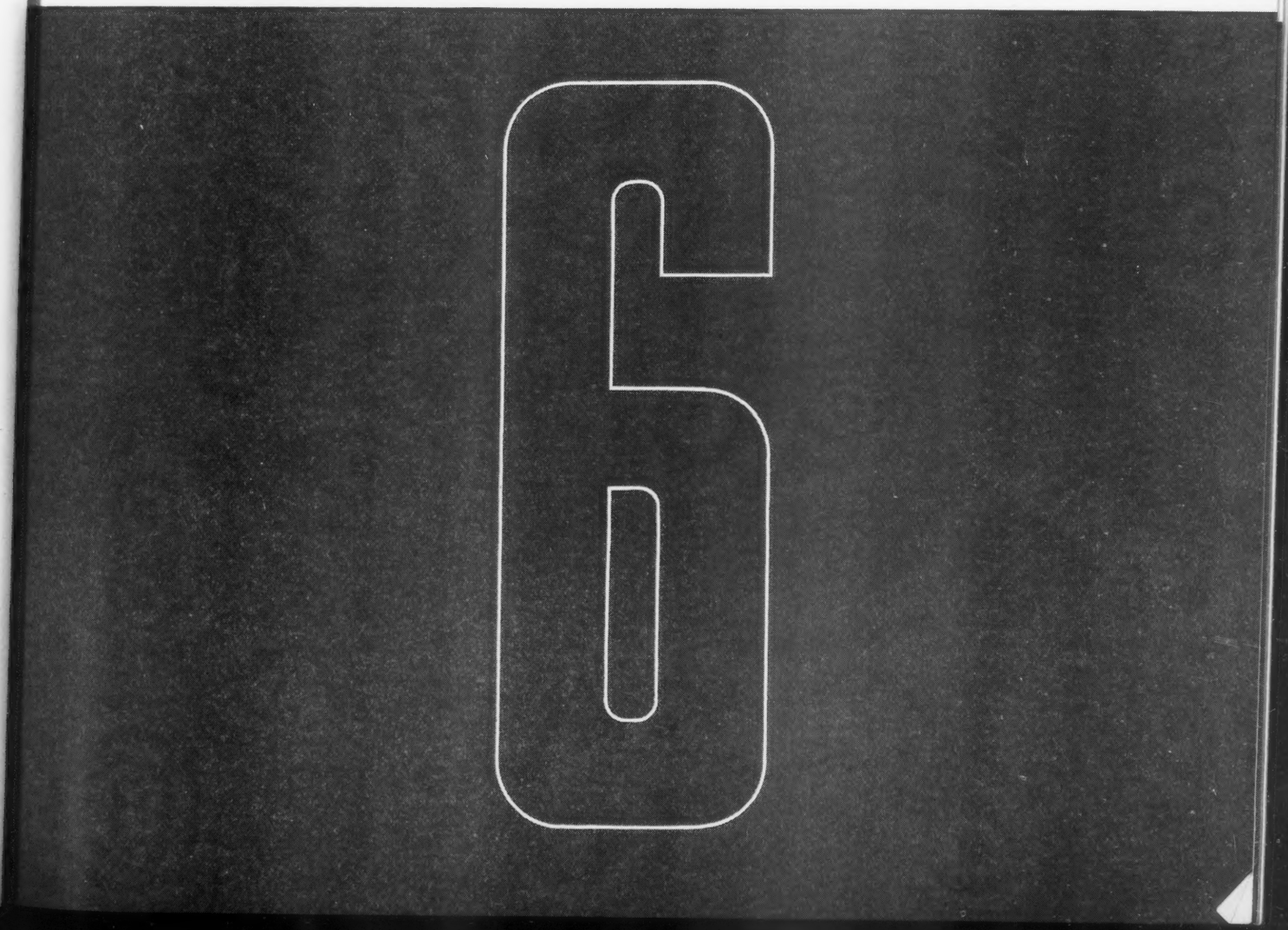
Publicity an Aid to Good Housekeeping

Cleanliness and orderliness must, by executive order, be maintained at all times in all departments of our plant, reports a plant executive. Since there are many visitors during the course of a year, all department heads are constantly on the alert to see that these requirements are fulfilled.

To make each department a source of pride to the man in charge, large signs are hung from the ceiling, giving his name and that of the depart-

(CONTINUED ON PAGE 172)

PRODUCTION PLANNING AND CONTROL



Some 100 employees of Addressograph-Multigraph's special parts and tool department (item 275) get their job tickets at this production control desk

275

Schedules Work for 100 Men

One hundred workmen in the special parts and tool department at Addressograph - Multigraph Company get their job assignments at the desk shown in the photograph. The schedule board at the left holds productive labor tickets. Pigeon holes in front of the clerk are indexed by workman's number and hold tickets for jobs assigned. One file of addressing machine plates contains names and numbers of workmen. Two other files contain operation and title plates for special jobs.

276

Machine Control Helps Meet Delivery Dates

The Hoist Plant of Gar Wood Industries, Inc., machines parts for six other Gar Wood divisions. This involves the scheduling of one to ten jobs a day on 170 machines. Under normal conditions the problem is complicated by rush orders from several divisions that invariably demand special attention. Delivery dates often were difficult to meet until a system of machine control was adopted.

Copies of orders assigned to each machine are now accumulated on a visible board, indicating at a glance the total hours of work on hand for each machine, the job in process and those ahead, in the order in which they are to be run. Jobs are scheduled so that machines are loaded evenly and advantageously. Delivery dates are met and precedence is given to rush jobs.

277

Keeps Mill on Schedule

For big expensive machinery, why not a schedule board like the one in use at The Munising Paper Company, Munising, Mich.? It's $14\frac{1}{2}$ x $3\frac{1}{2}$ ft. and shows what's ahead of each of two Fourdrinier machines day by day, hour by hour, for the next 10 weeks. There are 14 divisions vertically, 5 horizontally. For each of the five divisions there is a pair of metal guides to hold job tickets, one guide for each machine. So long as there is no change of schedule, all that is necessary to keep the mill running on time is to give out the orders as the time for starting them arrives. Adaptable to operations where the time element may be predetermined with a fair degree of accuracy.

278

Assures Uniform Paint Jobs

To provide absolutely uniform colors, Buick Motor Company has a central lacquer mixing room. There are ten standard colors, piped separately to each booth. Some 3 miles of pipe has been installed. This arrangement saves space that would otherwise be cluttered up with individual 5-gal. mixing tanks, diminishes the fire hazard, simplifies housekeeping, and eliminates trucking of drums to each booth.

279

5 Places to Look for Spoilage

Spoilage may be traced to innumerable causes, yet they may all be separated into five basic classes, as follows:

1. Engineering and drafting error.
2. Defective workmanship.
3. Damaged in handling.
4. Defective materials purchased.
5. Surplus and obsolete materials.

280

Shipping Room Bonus Adds 20% to Earnings

When the shipping room at Prophy-lac-tic Brush Company went on group bonus, standard times were developed for each of the many containers used, also for miscellaneous jobs like cleaning. To measure the day's work, the time clerk has only to keep a tally of shipments, stock put away, and any special job assigned to the group. Group efficiency is found by dividing total standard minutes by actual minutes. Bonus is then paid each man according to the class of work he does. Every job in the shop has been classified. There are seven classes in all, which pay bonuses ranging from 25¢ to $1.75 for 100 per cent efficiency. No bonus when efficiency is below 70 per cent.

The men can make 20 to 25 per cent more money. The company gets lower unit costs.

281

Cuts Tool Breakage 50%

The Webster Electric Company, Racine, Wis., modernized its tool crib methods through the adoption of a control system, with the expectation that savings would result through lower crib inventory, reduced breakage, and reduction in the loss of tools.

They were surprised and gratified to find that one of the greatest advantages derived was elimination of misunderstandings and contention between employees and crib attendants. The definite fixing of responsibility has been of inestimable value in improving employee relations.

Original expectations also were met. As soon as it became apparent to employees that carelessness in handling tools was being reported to their

superiors, a 50 per cent reduction in tool breakage occurred almost overnight. Tool investment has also been reduced, and time is no longer wasted searching for tools on the production floor.

Service is much speedier; pressure on crib attendants has been reduced, time spent at the crib window by productive workmen has been minimized.

282

Stocking Up on Quality

Control of quality by "feel" or "looks," all too common with those who have to wrestle with natural materials, has been on the way out at Phoenix Hosiery Company ever since its new lab was set up. For example, the girls in the photograph are inspecting work from the leggers. At intervals of not more than two weeks, samples of the work of every operator are inspected. Defects are made the occasion for instructing operators, or for remedying faults in equipment or materials.

283

Makes Up to 250 Copies

In a large plant that has to make many copies of the original order, a hectographing method has been adopted. As many as 250 copies can be made from the master which is produced on a regular typewriter using special carbon paper.

When a repeat order comes in, the master is pulled out of the files and the top line which contains the variable information is cut off. A new top line is then typed on another master. The two are then matched up and the copies are made. The master with only the variable information is then discarded, and the one with the constant data is returned to the files.

284

Downed Inventory $100,000

When inventory got out of hand to the tune of $100,000 in a small plant that stocks 3,000 items, an effective control soon brought it back to normal. It provides reports on (1) idle machines, (2) piece parts falling below minimum, (3) machines behind schedule, (4) orders behind schedule, (5) present compared with standard operations, (6) departmental performance.

285

90% Saved on Steel Samples

A large steel mill takes a sample of the last billet from each bloom of high-grade steel for etching to determine the presence of "piping." Formerly these samples were cut off on a cold saw. With this method samples of vanadium steel 2½ x 8 in. in cross section cost from $1.35 to $1.85 each. The same cut made with a machine-guided oxy-acetylene blow pipe cost about 8¢, representing a reduction of about 90 per cent.

A portable cutting machine is now used for preparing all samples.

286

Cuts Shipping Costs

The "forward stock" plan cuts the cost of shipping small orders. It works equally well in a Chicago plant that makes surgical dressings and in a brassiere factory in the New York area—which would appear to establish its universal applicability. The idea, of course, is merely to carry small stocks of each of the active items in bins at convenient central location. Saves order pickers any amount of working. A stock boy replenishes forward stocks from regular stocks. Inventory records are kept only of withdrawals from regular stocks, thus saving a tremendous number of small entries.

287

11 Men Do 19 Men's Work

Eleven men do 19 men's work since McCord Radiator & Mfg. Co., Wyandotte, Mich., installed a 50-50 bonus plan for truckers and sweepers. Moves to and from machines are now made promptly. There always used to be an acute shortage of containers both for product and for scrap. Now there are always plenty of each kind. Plant is cleaner.

288

Three Machines Were Enough

Three automatic machines in one plant seemingly could not keep up with requirements, and purchase of a fourth unit was being considered. When it was found that no one knew what percentage of the time the three existing machines were in actual production, a graphic time recorder was set up.

On one day, for example, the records showed that two machines were down nearly all day, while being set up for new jobs. The tool department was the neck of the bottle. Obviously the solution was to speed up the work of the tool department, or schedule machine operation so that only one machine would have to be set up at a time.

The latter solution was chosen, and purchase of the additional machine was postponed indefinitely.

289

Two Do Six Clerks' Work

Formerly, when orders came into the production department of the International Harvester Company's Springfield, Ohio, plant, they were handled by six to eight men who made four pencil copies on a fan-folded tag. Aside from the slowness and expense of this method the tags were sometimes difficult to read, and lack of sufficient number of copies often resulted in costly delays.

When a duplicating machine was

Seconds, once a big headache at Phoenix (item 282), are of small moment now that the modern research approach has replaced rule-of-thumb fumbling

installed it was found that two typists could handle all the forms that were previously written by six clerks. It takes a little more than half a day for the operator to produce twenty copies of each order, so that every department concerned can have one. In addition, mistakes on tickets and delays in getting them have been eliminated.

290

It Schedules Just the Same

No two orders for the more than 80 different packaging machines made by Pneumatic Scale Corporation, Ltd., are alike. The line varies from nearly 100 per cent standard to practically 100 per cent special. But this concern schedules just the same.

Its system is divided into two main sections—one for replacing standard parts for the stockroom, the other for customers' orders made up of standard plus special parts in varying combinations.

A quick picture of manufacturing progress is afforded by charts on a visible control board. Charts are posted day by day. A separate one is kept for each unit of each machine that is being built.

291

Used to Waste $1,910 a Year

In the design of tools for manufacturing operations there is often a wider end and side allowance than is necessary for facility and accuracy of operation, or even a larger cut-off tool or saw is used than the occasion demands. A small, almost negligible loss, it would seem. But when thousands or millions of pieces are made the loss in excess waste amounts in a year to surprising figures.

Take, for example, a small insert made from $\frac{1}{8}$th-in. round brass rod. The standard cut-off could be reduced from 0.045 in. to about 0.028 in. on this particular job, making a saving of 0.017 in. per piece. This difference was scarcely perceptible, and yet when figured on the basis of the annual production of 100,000,000 a year the saving was $1,910.

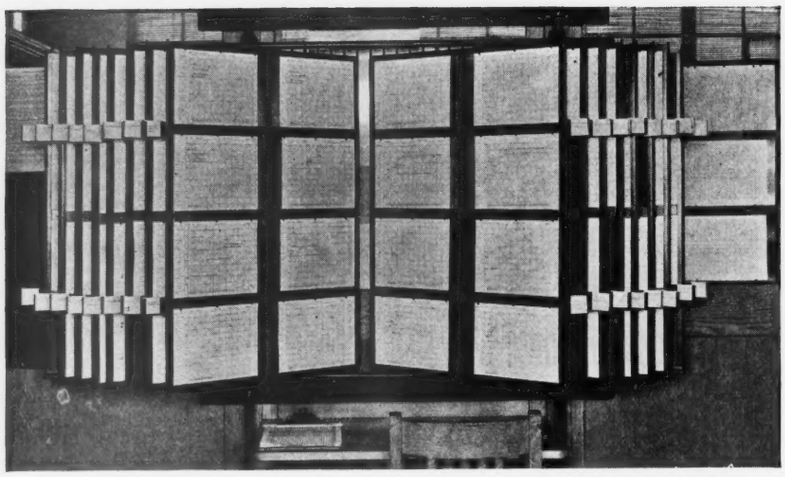
292

More Work, Closer Control At Little Extra Cost

Plant expansion at Chicago Flexible Shaft Company, Chicago, has made rigid control over work in process particularly essential. Experience with a certain system of production control led to an extension of the system for machine scheduling and the checking of work-in-process. In various shop departments, as many as five jobs frequently are scheduled ahead to machines or operators, with an obvious reduction in idle time.

Copies of all productive labor tickets are filed in the central production office on planning boards, by operations, instead of posting production figures to ledger sheets or cards. This provides a graphic record of all work-in-process, a continuous check on production by piece-part numbers and operations, and an instant check on counts at every operation.

The simplicity of these controls has facilitated handling of the increased production with a minimum of additional clerical expense.



Visual control board at Pneumatic Scale Corporation (item 290) schedules a line that varies from 100 per cent standard to almost 100 per cent special

293

Show Them What They Waste

"Six bits" is about the top price put on a spoiled tool or part by the average wage earner. That's why Westinghouse—to cite one of a number of examples—uses display boards to keep employees constantly reminded of the true cost of waste.

294

Forelady's a Clerk No More

The forelady in the plant of S. E. Rains Company, Warren, R. I., handkerchief manufacturers, used to spend more than half her time in filling out printed order tickets. Cost of printing these tickets, amounting to more than $100 a year, is now saved by making up blank forms on a duplicating machine. As orders are received the blank work ticket forms are again passed through the machine, which fills in the information needed for each lot.

Aside from the saving in printing cost, errors always present in hand copying have been eliminated; tickets are much more legible; and the forelady can now devote all her time to supervision.

295

They Get the Orders Because

A small plant keeps right on selling a brass sleeve in large quantities to one of its giant competitors, despite the fact that the latter has idle equipment suitable for the job. Not that the big plant can't make just as good a sleeve. It's because the small plant can take the contract profitably with an infinitesimal overhead loading. And the reason for that is, the man who makes the sleeves knows how so well that he requires no supervision, no inspection. He throws out defective sleeves as quickly as the boss would.

296

Costs Little to Know Cost

Standard costs are used by St. Charles Manufacturing Co., St. Charles, Ill., to determine the cost of kitchen cabinets and other sheet-metal products. Realizing the necessity of prompt, accurate records to measure the efficiency of various departments in comparison with established standards, they adopted a recognized cost and payroll system.

A three-copy labor ticket provides them with data for distributing both productive and non-productive labor departmentally, and for accumulating a record of the labor expended on individual manufacturing orders. Variances from standards are thus promptly revealed, localized to the point of origin. The use of the third

Conveyorized assembly at Caterpillar Tractor Company (item 298) is effective means of controlling production. It sets the pace for the whole factory

copy of the labor ticket simplifies making up the payroll. All three records are prepared with a single posting.

297

Black Background Better

Various light colors have been used as a background for product inspection. Pro-phy-lac-tic Brush Company, on the other hand, finds black the best color for inspection benches. In the first place, bristles are white. Second, black does not clash with any of the colors used on the handles.

298

Conveyor Controls Production

Diesel engines at Caterpillar Tractor Company were formerly assembled on a line when motor blocks were mounted on dollies and pushed along by hand. Now the assembly is done on a conveyer which sets the pace for the entire plant, controlling production as it never could be controlled in the old push-and-pull days.

While the old line was operating, a man was supposed to perform his operation and then push the work along. Whether he actually did his job on time, and pushed it along to the next station, was pretty hard for the foreman to control. What happened was that a good many jobs stayed too long at one station; then everybody hustled in an effort to catch up—which was sometimes successful and more often not. In brief, production was by fits and jerks.

What the conveyor assembly line did, then, was to tone up the morale of the entire diesel factory. The ever-moving line somehow caught the imagination of the key men and the rank and file. They saw themselves—as they had never been able to see with the old push-pull line—as part of the mechanism that gears right into this final assembly operation. And they improved their own work accordingly.

At Warner & Swasey all parts needed for a given lot go to assembly on storage racks like these (item 300)

299

Cut Costs of Rejects from $35,000 to $10,000

A serious loss in final test in a certain section at General Electric Company, Pittsfield, Mass., was thought to be partly due to a certain amount of carelessness on the part of operators, but it was also realized that a large part was due to defects in materials which could not be eliminated. It was hard to differentiate between failure due to operator and that due to defective material. A plan was devised in which the operators marked all the parts made by them, and the rejects were carefully examined for cause. It was difficult at first to fix responsibility, but after a few weeks the inspector became very proficient and the operators were shown evidence of their negligence. Each week a list was posted in a conspicuous place showing names of operators, number of parts defective, and loss due to negligence of each operator. Annual loss in this section was reduced from $35,000 to $10,000.

300

Storage at Assembly Line

Here's how lot-storage of parts at assembly lines works at Warner & Swasey Company. Say a lot of 20 machines in a given size is to be assembled. An order for the necessary parts is sent in advance to the stockroom. The stockroom force places all the parts necessary for the assembly upon steel racks with integral skid bases which are picked up by electric trucks and moved to the assembly floor. There they stand until emptied of parts as assembly progresses.

301

Bench for Better Inspection

Handy bench used by one plant for the inspection of small machined parts and assemblies has a removable board at the back on which blueprints can be posted, and a small shelf for tools or gages. A blueprint, when attached to the board, is always visible and out of the inspector's way. It is not being constantly folded and unfolded until it becomes soiled and illegible and has to be replaced.

302

Going to Make a Profit

Although a profit-and-loss statement is of some value in planning for the future, a predetermined statement is obviously of greater value because it forecasts results under certain conditions, and warns that results expected will not be achieved when conditions change. Management is consequently able to adopt remedial measures in time.

That is cost control experience at Fox Chase Knitting Mills, Inc., where forecasting is done by estimating (1) sales in three main classes of products, (2) materials and labor costs, (3) burden. It is then possible to determine what profit or loss will result from capacity operation in total

and by each classification. Final step, of course, is to show profit or loss at varying sales volumes.

303

Three Ways to Figure Burden

Three accepted methods of accounting for the distribution of overhead can be expressed in the following formulas:

1. Productive labor + material + overhead in terms of percentage of the addition of these two elements = total cost.
2. Productive labor + material + overhead calculated on percentage of productive labor = total cost.
3. Productive labor + material + manufacturing overhead in terms of percentage of productive labor = manufacturing cost. Manufacturing cost + selling and administrative expense expressed in percentage of manufacturing cost = total cost.

304

Run Their Own Businesses

Productive manufacturing employees at The Esterline-Angus Company are divided into small groups, all men working on the same orders comprising a group. A group accepts an order on a cost-plus basis. Cost is actual wages applied on the job. Profit is 40 per cent of the difference betwen this labor cost and what the cost would be on a straight wage basis. The profits of each group are compared and paid once a month.

Out of its 60 per cent share the company pays the cost of accounting and provides the last word in equipment, which of course results in increased employee and company profits. The effect is to make each group a little contracting company, in business for themselves, with an opportunity to make a profit over their wages, depending on their interest, skill and industry.

305

52 Pay Checks a Year

Wage earners live by the year, not by the week. Nunn-Bush Shoe Company recognizes this fact in its wage plan which guarantees 52 pay checks a year, makes labor costs a fixed proportion of sales revenue, adds to labor's income as shoe prices go up, makes for employee security.

306

Better Than a Bonus

A West Coast concern has a profit-sharing plan which provides additional compensation in proportion to dividends paid to stockholders. It sets aside an amount equal to the dividend on 150,000 shares (about 9 per cent of outstanding stock) each time it declares a dividend. Service of more than 6 months but less than a year entitles a man to 2 units; more than a year but less than 2 years, 5 units; more than 2 years, 6 units.

307

Checks Every Job 44 Ways

Eighteen years of experience has taught the Goodyear Tire & Rubber Company that an incentive plan is no better than the rates upon which it is based. If there is to be any incentive, employees must be able to understand that an accurate measurement of each job's money value is being made.

In making a base rate calculation, the job evaluator at this concern checks the job for the presence of 44 different factors that may be divided into three groups—physical requirements, mental requirements, and job conditions. No job combines all 44 of these factors; some jobs may contain as many as 25, others as few as 6 or 8.

308

Stockroom on Wheels

One plant that manufactures a perishable product has put its stockroom on wheels. At least the product is stored in steel bins that are readily moved by lift truck from packing to storage and out to the shipping room as needed. To be certain the old stock moves first, the bin in front is always the next one to go to the shipper.

309

A Place for Every Tool

Do you depend upon the memories of one or two men to locate tools? Why not divide your die racks, as one concern does, into numbered sections? Each section has 8 shelves; each shelf, 15 bins. Shelves are lettered, bins numbered. Thus a die located in the fifth section, *B* shelf, fourth bin, would be numbered *5-B-4*. There is a card for each die. In actual practice the set-up man memorizes locations, consults file only when necessary.

One of the groups at Esterline-Angus who "run their own businesses" (item 304)

310

Line vs. Job Production

A major advantage of continuous production is that it permits the use of single-purpose machinery or other equipment that involves too large an investment to be profitable in batch manufacturing. That is the experience of a General Motors division which switched its truck business to line production and left coach manufacture on a job basis.

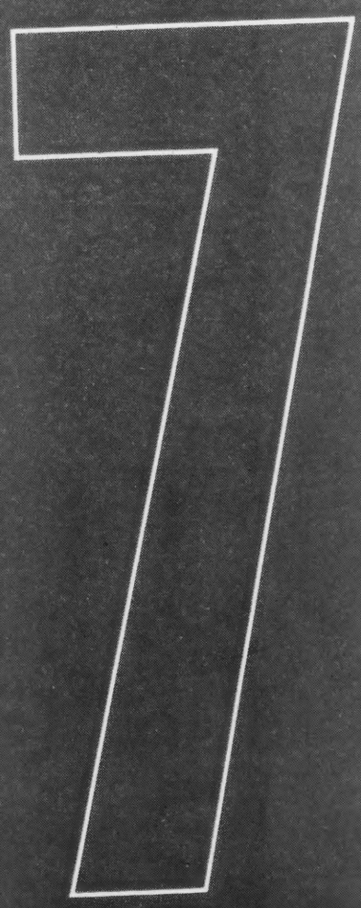
311

Save 10% on Lumber Drying

Yard seasoning, improperly done, can ruin lots of lumber. Specifications at one furniture plant include piling 14 in. off the ground in front, 6 in. in the rear. Different lengths are piled

(CONTINUED ON PAGE 182)

PUBLIC AND EMPLOYEE RELATIONS



312

Accounts for 1¼ Billions

The story of 9 years and a billion and a quarter dollars—how this amount has been disbursed to suppliers, employees, stockholders, and others—is told by Westinghouse Electric & Manufacturing Company in a recent report which may well serve as a model for others who know the value of this new technique of public relations.

"The financial history of these nine years (1929 to 1937) is of interest to many," the report states, "particularly to those who, having been Westinghouse men or women throughout the period, have had a continuous part in making that history."

Set forth in language anyone can understand, the report is a consolidated statement of operations showing total income and disbursements. After paying out 38.9 per cent for materials, supplies, fuel, and transportation, the company set aside 4.6 per cent to replace plant and equipment, paid 3.4 per cent in taxes, had 53.1 per cent left for employees, stockholders, and future needs. Employees received 46.7 per cent in wages and salaries; group insurance premiums and payments to the employee annuity fund amounted to 1.2 per cent; which left net earnings of 5.2 per cent available for stockholders and for future needs.

313

Promotes Free Expression

For free and unrestrained expression and interchange of opinion, make up training classes according to rank. Don't mix major operating executives with foremen. And it's not a bad idea to let assistant foremen meet by themselves rather than with the foremen.

314

So They Asked for Milk

Steel workers at American Rolling Mill Company asked to have milk sold in the plant, now consume 1,500 pints daily. They find it gives them the pick-up they need between meals.

315

Clean Oil, No Infections

A simple procedure adopted by one plant some time ago has been in use long enough to demonstrate its ability to eliminate a serious health hazard.

A solution of a cleaning material, which physically removes old oil, dirt, and chip accumulations, is passed through the cutting oil system at periodic intervals. Once the system is clean, a solution of high bactericidal qualities is circulated through the equipment. After rinsing, a new batch of cutting oil is made up in the system.

In this way skin troubles from cutting oil were eliminated. Infectious bacteria in cutting oil are usually picked up from the skin of some of the men. As time goes on, the increasing contamination threatens other men with infection, or even the same men with re-infection.

This preliminary cleaning and sterilizing procedure affords an inexpensive safeguard against contaminating new oil with bacteria left in the system from the previous charge.

Pairing is better (item 318) at Apex Hosiery Company because this ware room is air-conditioned. Packers work with more accuracy and greater dispatch

316

Prevents Chemical Burns

For employees in chemical plants or those who work around corrosive and poisonous substances, there are acid-proof garments with a special rubber latex coating. Latex is applied only to outside so they feel no different than ordinary clothing in the wearing.

Overalls, dungarees, gloves, and other items come specially prepared in this way. When wearing them, the employee's mind can be free of the danger of chemical burns.

317

How It Distributes Income

Notable example of company reports that make for better public relations is Republic Steel Corporation's for 1937. Addressed to the stockholders, it contains, in addition to the usual balance sheet, facts about collective bargaining, vacations for wage employees, safety activities, group insurance, etc. One valuable exhibit is the approximate distribution of gross income: Wages and salaries, 35.08 per cent; materials and other expenses, 51.52; depreciation and depletion, 4.26; interest on borrowed money, 1.87; taxes, 3.69; profit, 3.58.

318

Conditioned for Comfort

Heat and humidity hold no terrors for employees of the Apex Hosiery Company. It may be 90 deg. in the shade in Philadelphia, but it is sure to be 10 deg. cooler in this textile mill. Incidentally, this is one of those plants that have been conditioned for comfort. Here it's air conditioning *first* for people, then second for products and third for profits.

Results after three years' experience have been gratifying. Absences have been reduced throughout the year—in summer because the mill is a pleasant place to work in, in winter because colds and related illnesses are less common.

319

Be Safe When You Pour

Transportation and handling of flammable liquids are operations that are common to practically all plants. When such liquids are poured from one container to another, as is fre-

quently necessary, it is highly important that both containers be electrically bonded together and connected to ground. When the container that is being filled rests on platform scales, the other container should be grounded to the platform of the scales.

320

Teaches in a Big Way

Caterpillar Tractor Company, Peoria, Ill., teaches its apprentices the facts of "slipstick" operation in what might be called a big way. Hung up on the wall is a slide rule some 6 ft. in length—big enough so that when the instructor works it everyone in the class can see what he's doing.

321

Tells Employees the Facts About Business

S. D. Warren Company, Boston, "believes that the facts about business can be made credible to a large portion of the public if the facts are presented to small groups by spokesmen who are known and trusted by those groups." And it believes further "that employers who respect, and are respected by, their employees are the logical spokesmen . . . that, by means of these bulletins, one small segment of the public can be made aware of facts that should be known and understood by every American."

Which explains a series of 21 bulletins prepared for and addressed to the 2,000 employees of the company. Each bulletin presents a slice of the facts. Number 15, for example, is titled "The Money That Business Takes In," and describes the customer's share of the income (increased value through research and the development of better qualities in products without increasing prices, or of methods that reduce prices without lowering quality), the employee's share, and the investor's. Bulletins are printed on Warren paper, naturally, and the employee is told to "look in side—see how customers use our paper."

322

A Safety Man on Every Job

In one plant, superintendents are required to appoint from 5 to 10 per cent of their men each month as safety observers. Since the men are selected according to plant layout, as well as the kind of work they do, one of them is likely to be reasonably close to any given job or kind of work that is going on at any given time. It is his duty to report to his foreman any unsafe practices or conditions he notices.

323

Talks About the Business

"Let us sit down together and talk a little about our business," is the opening sentence in the employees' edition of the annual report for 1937 made by the president of Monsanto Chemical Company, St. Louis.

It contains an explanatory balance sheet which shows how much of each item of assets is invested per employee. It is this investment—total, $10,011.75—that makes each employee's job possible. The report covers questions uppermost in wage earners' thoughts, such as why we have stockholders, where the employee fits into the picture, what the stockholder gets and what I get, who is my *real* boss, what is back of my job, what is being done to offset depressions as they occur, and so on.

Teaching the facts of "slipstick" operation (item 320) at Caterpillar

324

Music Hath Charms

An increasing number of companies, among them Maiden Form Brassiere Co., Bayonne, N. J., report worth-while benefit from playing phonograph records or the radio over the public address system. They are played during the entire lunch period, during the fatigue period in the afternoon, and during parts of production periods.

325

Asked the Neighbors In

The "open house" plan is something any industry can use. It gives hometowners an opportunity of finding out what goes on "down at the mill," and costs little to put on. American Rolling Mill Company, to cite an example, invited friends, relations, local business and professional men; let superintendents, foremen, and supervisors plan and arrange displays and act as hosts. Natural result was better understanding between management and men.

326

Use Right Kind of Hose

When flammable liquids must be passed through a hose line, use an approved gasoline hose. Such hose has a flexible metal inner tube with a rubber covering, which in turn is protected by an outer covering of some kind. The inner tube and the fittings at both ends are electrically connected.

327

If You Must Turn Him Down

When an applicant for employment must be turned down, slip him the bad news gently but firmly. He or she would rather have it that way.

And don't overlook the fact that the way a person is turned down is important. If he hasn't a chance and isn't told so, he'll be back to see you—to your embarrassment and his deepening disappointment. His thoughts about the concern will be anything but kind; add to them what his family and his friends will think

That Westinghouse believes in the efficacy of the bite between meals is evidenced by the cafeterias (item 328) that roll up and down its aisles

of this pussyfooting, and you'll see no good will is building for the company.

328

The Cafeterias Go Rolling Along

Strong in the belief that a bite to eat at odd times wards off fatigue and preserves cheerful dispositions, Westinghouse Electric & Manufacturing Company has installed rolling cafeterias at its East Pittsburgh works. Five times a day they appear with loads of sandwiches, milk, coffee, soft drinks, ice cream, candy, pie, and cake. Designed by the manager of the employees' restaurants, they are operated under the supervision of the company's medical department.

329

Parking Out of the Cold

Few employers think of offering roofed-over parking for employees' cars free of charge, or heated garage space at less than cost—only those who realize that the least expensive labor policy is one that produces a genuine satisfaction with the job.

330

Asks Employees What Jobs They'd Like

Employees at one plant are requested twice a year—through some such method as posting a notice on the clocks—to notify the employment manager if they have any particular desire to work into other kinds of jobs or other departments. This is so thoroughly understood that there is a steady trickle of letters into the employment department from people throughout the organization.

All such letters are kept on file. The files are set up according to departments and classes of work. For instance, when a vacancy occurs in the ranks of the traveling service mechanics, the employment department turns to the service mechanic letter file, pulls out the sheaf, and goes into action.

331

Safety Begins at the Top

Management should give its men full backing in safety enforcement. The employee who reports unsafe conditions to his immediate boss should be given to understand that it is definitely his privilege and even obligation to appeal higher up if no steps are taken to remedy them.

332

Houses They Can Afford

One of the independent meat packers had two problems—not enough houses for employees, not enough work for the crating department. Result is housing that employees can really afford, pre-fabricated in the crating room. Local banks do the financing, mostly on the basis of salary loans. The company—Geo. A. Hormel & Company, Austin, Minn.—finds that this practise helps an employee get his roots down into the soil, makes him a substantial citizen and taxpayer.

333

4 Questions Before Hiring

The employment department of the New Departure Division, General Motors Corporation, Bristol, Conn., asks itself four questions when considering a man:

1. Can he do his work to our satisfaction?
2. Will his general physical condition permit him to do this work?
3. Will he be able to progress on the work to *his* satisfaction?
4. Will he cooperate with others?

The applicant gets the job if all the answers are Yes.

334

Those In-Between Snacks

Employees who eat frequently during the day work with greater enthusiasm and less fatigue, get more done. Between-meal snacks benefit both management and wage earners. Beech-Nut Packing Company, for one, finds it pays to maintain a cafeteria where employees may go at any time for a bite between meals.

335

Safe from Breaking Bulbs

Accidents when replacing overhead lamps are prevented at Westinghouse Lamp Company, Bloomfield, N. J., by using a wooden pole fitted with rubber-covered prongs which fit over and hold the bulb tightly enough to permit its being unscrewed. Below the prongs is a cone-shaped basket made of 100-mesh wire, whose upper or open end is about the size of the reflector. Its purpose is to catch all fragments of glass in case a bulb breaks.

336

Hang Clothes from Ceiling

Service building for employees of the Merchants Mills, Lehigh Division, Bethlehem Steel Company, is designed to accommodate 977 men in three-shift spreads. Two rooms on the ground floor are assigned to mill men, who are restricted as a safety measure from using the stairway on account of the heavy shoes and other protective trappings they must wear. These two rooms are equipped with eight individual showers, two 54-in. wash fountains, toilet facilities, and individual clothes baskets suspended on chains. Three rooms on the second floor are set aside for chippers, grinders, and maintenance men respectively.

As water is drawn either in wash fountains or showers, live steam is injected into the system to keep the running water at a predetermined temperature.

Showers, wash fountains, and individual clothes baskets suspended on chains are features (item 336) of this service building at Bethlehem Steel Company

337

Out of Foremen's Meetings

Regular meetings of foremen with superintendent at Graton & Knight Company, Worcester, Mass., have:

1. Promoted a closer relationship with the superintendent and a better understanding among department heads.

2. Coordinated efforts for smoother and more efficient operation of inter-departmental contacts.

3. Provided a forum for frank discussion and freely expressed opinions regarding common problems.

4. Encouraged constructive thinking that will help solve these difficulties.

338

Helps Teach First Aid

An anatomical shirt has been devised for first-aid training. Arteries, bones, and organs of the torso and arms are painted in black outline and colors on a sweatshirt.

339

They Laughed When He Timed Them in the Showers

Taking a shower after the day's work is a fitting subject for time-study, they decided at Dunlop Tire & Rubber Corporation, Buffalo—so they did it. With a regular timestudy sheet they broke down into 10 steps the operation of "a thorough wash and a change of clothes after a day's work."

It was all in the lighter vein, of course, but helped take some of the seriousness out of timestudy and sell the idea of a daily bath to employees. And everyone got a chuckle.

340

No Slips and Slides Here

Seen in a pulp mill: Good grade of roofing paper laid in passageway along the side of a long row of stock screens to furnish safe footing in case wet stock slops over the side of screens.

341

To Talk About at Meetings

Miscellaneous items that, in one company's experience, can be discussed at meetings of superintendents and department heads:

1. Survey of employees' outside schooling and self-betterment.

2. Clock punching by proxy.

3. Personal use of company equipment by employees remaining after hours.

4. Use of equipment of one department by employees of another.

5. Indexing of versatile employees so that they may be transferred from one department to another.

342

Replacing the President

Let employees know you want them to climb—that you have as your ideal the old-fashioned notion that when a president has to be replaced it should be done by taking on a new apprentice and moving one long string of employees a notch upward. That's one reason why Caterpillar Tractor Company is a good plant to work in.

343

Held a Safety Sweepstakes

All safety records for the plant were broken when Briggs Manufacturing Company, Detroit, ran its Briggs Handicap Safety Sweepstakes. Tiny horses on a wall racetrack moved ahead each day as the departments they represented operated without a lost-time accident.

The director of industrial relations said that this safety contest had done more to set employees thinking about safe plant practices than any other medium of accident prevention ever tried before by the company.

344

Putting the New Employee To Work

Three simple steps, so often done haphazardly, will go far to get a new employee into the swing of plant quickly.

First, start him out in a friendly atmosphere. Introduce him to his foreman and the men he'll work with or close to.

Second, show him how to do the job. Don't leave him to find out. Those who have been around a long time know the best way to do it, but he doesn't.

Third, give him a general idea of what is considered a good day's work on the job. From the start he should

Getting vacation pay at Packard Motor Car Company (item 345), whose prime objective is to provide steady jobs at good pay under the best conditions

know what the quality and production standards are.

345
Begins with Vacation Pay

Security for wage earners begins with steady jobs at good pay under the best possible working conditions. Those are the prime objectives in any good program for industrial relations. Where to go from there, depends on ability to pay. Packard Motor Car Company, for instance, feels its way with separation pay, retirement allowances, and vacations with pay. It pays for them from savings that are made by cutting costs without taking anything out of the product.

346
More Work, Less Fatigue With Right Seats

Operators of a certain type of punching machine in one large plant have to sit all day in a position that forces them to lean against the back of the seat.

Use of a chair with specially designed seat and adjustable back has reduced fatigue and made it possible for the operators to maintain a greater production that could not have been possible otherwise.

347
Men for Tomorrow's Jobs

Skimming the cream from the senior classes of the best engineering schools and putting them through a thorough training course to familiarize them with all departments is one effective way of building up the plant organization. Several large concerns have "talent scouts" who haunt college campuses during the spring of the year.

348
No One Wants the Elephant

A white elephant made of concrete and resplendent in a fresh coat of paint is now doing duty in a safety contest at the Pottstown Plant of Bethlehem Steel Company. The white elephant is awarded to the department with the most accidents. If there are no departments with lost-time accidents, the plant manager has to harbor this unwelcome mascot.

349
Warn of Guy Wires

Warning boards on guy wires and other small-diameter braces, such as the tie rods of steel structures supporting overhead pipe lines and conveyors, are standard safety practice in many plants. Because of their small diameter, wires may be practically invisible under night lighting. Even in daylight they are hard to see and employees may unwittingly trip over them or trucks run into them.

350
Teams Against Accidents

An "After the Whistle Blows" safety campaign in four acts was effectively staged at Du Pont Rayon Company, Old Hickory, Tenn.: Act 1, Home Inspection; Act 2, Automobile and Traffic; Act 3, First Aid; Act 4, Home Hazard Survey. To get the spirit of competition into it, employees were divided in two teams—a "Red" team composed of those with odd numbers on their clock cards, a "Green" team made up of those with even numbers.

351
Makes It Safe to Handle Flammable Liquids

Static charges introduce a hazard in any process in which flammable solvents are used. Impregnating, coating, and spreading are common examples of such processes. The material treated, paper or fabric, is flammable, and the solvent in the coating compound is highly so. Handling of the material to be treated, and some of the other operations, tend to produce static charges which must be drained off to ground as quickly and thoroughly as possible.

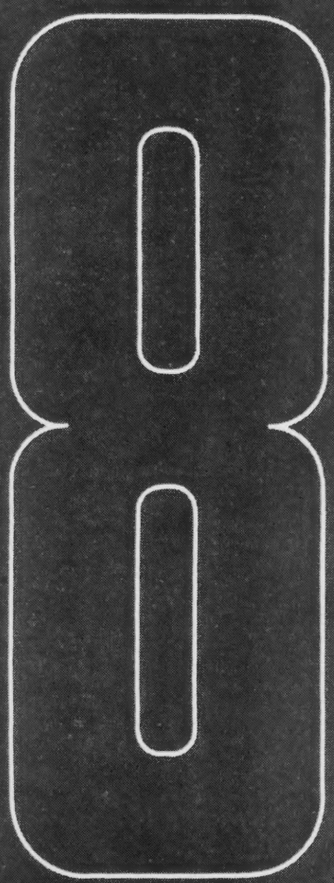
352
Keeps Loan Sharks Away

Credit unions keep loan sharks away from employees. They provide at one and the same time a convenient depository for savings and a source of emergency loans. If a man has a bit saved for the rainy day and a lending agency where his credit is good, his mind is going to be a far sight easier and he'll do more and better work.

353
No One Can Go In Without Goggles On

In two years the Pullman Company spent $25,000 for goggles, equipped everybody in the plant with them. Reductions in eye injuries lowered plant costs by $116,000. This was a net profit of 364 per cent, a mighty good return for any investment.

PRODUCTION METHODS AND MATERIALS



Power shear not only saves time (item 354) but also does a cleaner cutting job. The piece cut out is now salvaged and used on a smaller kitchen unit

354
Cuts Shear Time 70%

Portable power tools have cut the time 70 per cent on one job in a Philadelphia plant which makes modern kitchen equipment. To permit installation of a sink in a kitchen unit, it is necessary to cut out a rectangular section from a sheet of 18-gage stainless steel.

This work was formerly done with cold chisel and hammer, and the steel that was cut out—about 2 lb. worth approximately $1.50—had to be scrapped. Now a power drill with a hole saw is used to drill a hole which permits entry of the yoke of a portable shear. The shear not only saves time, but does a cleaner cutting job. The piece that is cut out is now salvaged and used for smaller kitchen units.

355
Saves Riveting Expense

Manufacturer of smoking stands and serving tables substituted assembly joints molded of plastic and saved expense and time of riveting and soldering metal. This permitted him to reach several markets that costs previously kept him out of.

356
Saves $140 a Ton

In the manufacture of spindles for precision grinders one plant found that replacement of the steel formerly used with a special, cold-finished bar stock resulted in a saving of $140 per ton of steel used. At the same time there was an increase in the machining rate of 25 surface feet per minute, equal to 20 per cent.

Elimination of carburizing, with subsequent cleaning and straightening, resulted in a saving of $8 per 100 lb., which is offset to some extent by the higher cost of the new steel, amounting to about $1 per 100 pounds.

357
Stronger Package Costs Less

Fels & Co., Philadelphia, is one of the many concerns that packs its product—soap chips, in this case—in plain cardboard shells covered with a tight wrapper which carries a coating of wax on the printed side only. This wrapper increases the package strength, also provides the protection of wax wrapping without the added cost of a separate outer wax paper wrap.

358
94 Container Sizes to 49

One of the largest producers of druggist supplies standardized sizes of corrugated shipping containers, reducing total number from 94 to 49.

Over a period of years departments had been ordering sizes and quantities of containers as they thought they needed them, without any attempt at standardization. For one particular item seven different boxes were in use, all having the same width and depth and varying in length from 25 to 26½ inches.

Price per thousand of these containers is very much higher for small quantities. Reducing sizes from 94 to 49 enabled this plant to purchase in larger quantities, and a considerable saving resulted.

359
Reduces Waste 24.3%

A company using hammer-type grinders to reduce a leafy product was getting these results:

Finished product	71.2 per cent
Byproduct	18.8 per cent
Waste	7.6 per cent
Invisible loss	2.4 per cent

The grinders were replaced by rotary knife cutters, with the following results:

Finished product	74.6 per cent
Byproduct	18.4 per cent
Waste	5.9 per cent
Invisible loss	1.0 per cent

Analyzing further, this means 4½ per cent increase in finished product, 24.3 per cent saving in waste, and 58.3 per cent saving in invisible loss.

360
$5,825 Since Installing

Carbon-steel screws and bronze nuts formerly used on a rolling mill in a steel plant had to be replaced because of wear after approximately 150,000 tons had been rolled.

Special surface-hardened screws and nuts installed in place of the other type are still in service after a production of nearly 420,000 tons. Savings are estimated at $0.0124 per ton, or a total of approximately $5,825 since installation.

361
$300 Timer Saves $2,000

Attaching contacts of non-welding material to bronze connectors in the manufacture of small electrical devices presented a difficult welding problem because of the characteristics of the materials. The contacts were brazed to their backing by means of a motor-driven resistance welder that provided mechanical control of contact pressure and "current on" period. Due to the critical nature of the operation and rigid inspection requirements for this assembly rejections ran excessively high, necessitating rewelding of some rejects and

scrapping of the remainder. Much time and money were spent on special welding fixtures and other methods for improving the efficiency of the operation, but without much success.

Application of a newly developed precision welder timer and contactor to this job resulted in cutting rejects from as high as 23 per cent to 1 per cent. Even this low percentage was attributed to causes other than welding defects. Savings amount to about $2,000 per year on one welding machine. The cost of equipping a machine with this timer control was $300.

362

Lowers Costs 86.6%

A manufacturer of diesel engines was able to cut the cost of flywheel bolts $34 per ton of steel used and increase the cutting speed 65 surface feet per minute—which amounts to 86.6 per cent—by changing to a special, cold-finished steel bar stock. In addition, there has been a 13-hour increase in the life of the tools.

363

Net Result: 30% Increase

Forming bumper guards from cold-rolled steel presented a difficult problem in an automobile parts plant. Only 400 pieces could be produced without shutting down the presses and cleaning the dies. The stamping compound in use left a deposit that produced an unsatisfactory finish on the parts and scratched the dies.

After a number of tests, a new stamping compound was adopted. In one period 3,300 pieces were produced without stopping to clean up. Since it is soluble in either hot or cold water, the compound is much easier to wash from the stampings. The net result was a 30 per cent increase in production. In addition, the parts are now coming off the presses free from scratches.

364

15% More Production

A 15 per cent increase in production in the hardening room was effected in the plant of a machine tool manufacturer by the use of a production recorder. This instrument, which is electrically controlled, automatically counts production time and units, and records the duration of production time as well as delays due to various causes. When a delay occurs manipulation of a telephone-type dial records the symbols representing the cause of the delay. Then the instrument keeps track of its duration. With the instrument mentioned previously seven causes of delay, such as changed quench, changed temperature, electrical trouble, and so on can be recorded.

Switching to a specially woven asbestos fabric impregnated with a flexible resinoid (item 368) increases life of ironing machine cover about 10 times

365

Laundering Saves $5,400

During a ten-month period 10,435 lb. of rags and 14,000 lb. of cheesecloth were laundered in one large plant at a cost of $870. If purchased new, this material would have cost about $6,275. Hence the laundering operation showed a profit of approximately $5,400.

366

It's 3½ lbs. Lighter

In the new model of a vacuum cleaner the number of molded plastic parts was increased from thirteen to eighteen, resulting in the elimination of many finishing processes. Now machines no longer have to be returned to the plant for refinishing after demonstration by salesmen. In addition, the weight of the machine was reduced 3½ pounds.

367

$193 Job Saves $3,312

It cost a bolt manufacturer $193.71 to reline his gas-fired furnace (hearth area 36x72 in.) with insulating refractory brick and refractory block insulation.

Heat-treating cost came down from $0.0034 to $0.0011 per lb. of metal. Daily output was boosted from 3,500 to 4,800 lb. He now gets eight heats instead of seven, 100 lb. more per charge, and a 1-hour shorter working day.

In one year the installation has paid back $3,312, a net profit of $3,119, an investment with 1,700 per cent dividend.

368

Extends Life from 6 Weeks To 14 Months

Duck or canvas coverings over laundry ironing machine paddings never lasted more than six weeks. This short life meant considerable labor cost in changing covers, and loss of output.

A new type of fabric made of a specially woven asbestos textile impregnated with a flexible resinoid has a life of nine to fourteen months in such service.

369

Speeds Up Production

Savings that in the aggregate amount to a considerable amount have been made by portable electric tools in the plant of a manufacturer of bakery and brewery equipment. For example, a disk sander has replaced hand filing in smoothing welds, cleaning metal parts before enameling, and so on, and does the work from ten to twenty times faster.

A belt sander is doing certain jobs much faster than could be done by

hand and in addition is performing some operations that could not be carried on manually.

Drilling of holes is now done by electric drills ten times or more faster than was formerly possible.

370

Removes Brand Marks

A large brewery had the problem of removing certain figures from wooden bottle cases. Since there were thousands of these cases and the number had been burned in with a branding iron, use of a hand scraper or plane was not feasible.

A portable belt sander was given a trial and it was found that it could remove the brand mark from four cases in one minute. A further advantage was that it left a smooth, level surface on which new figures could readily be placed.

So many other uses have been found for this sander, including resurfacing the inside of fermentation tanks, that the owners feel it has paid for itself many times over during the eight months it has been in service.

371

Better Control Cuts Cost

High production costs in a can factory were attributed to slow-acting temperature controllers on the body makers and can closers. The equipment in use could not control temperature closer than plus or minus 10 deg. F. As a result, overheating of the solder occurred when the line was shut down frequently, causing it to run too freely with the production of leaking seams or ends. Also, there was always danger that too much solder would seep into the cans and cause trouble.

The remedy for this condition was found in the installation of a two-point indicating temperature controller which utilizes the photoelectric principle to secure high accuracy and fast action. With the much closer control of temperature than formerly, the number of defective cans has been reduced and the consumption of solder cut to a minimum.

372

100% Faster Assembly

Use of self-tapping screws made it possible for a manufacturer of molded smoking sets to eliminate inserts in the molded parts. This change increased the speed of molding by 30 per cent, with a 100 per cent increase in the speed of assembly.

373

Less Wear, Saves $339

Sixteen cast-iron grilles weighing about 64 lb. each and forming the bedplate of a circular sandblasting machine at the Quick Meal Division of the American Stove Co., St. Louis, Mo., had to be replaced every three months, at a cost of $31.

When covered with a 3/8-in. sheet of soft rubber attached to a fiber base, the grilles gave 39 months' service before the covering had to be replaced. The saving is estimated at $339, which amounts to five times the cost of the covering.

Portable sander, used in brewery (item 370) to remove figures from wooden cases, paid for itself many times over during first 8 months of its life

374

$990 Return $2,333

In a steel mill trouble was experienced from rapid wear of the forged-steel screws and cast-iron nuts formerly used on the rolling mills. Eventually one mill was equipped with special, hardened-surface screws and nuts at a cost of $990.

Cost of the new equipment, per ton rolled, has been $0.0078, whereas it was formerly $0.0262 per ton, giving a saving of $0.0184 per ton. On an output of 126,830 tons rolled since installation the savings produced by the new screws and nuts amount to $2,333.

375

Pays 195% Dividend

Better work, reduced maintenance, and an annual reduction in costs of $4,100 are the advantages of a combustion-type, furnace-atmosphere controller, according to a metal-fabricating concern which used to have annealing troubles. Since the equipment cost only $2,100, the purchaser is getting, in addition to the other benefits, a yearly return of 195 per cent.

376

Pay Out in 8 Months

Welding operators in the Geneva, N. Y. Division of the Burnham Boiler Corporation are enthusiastic about their new a.c. arc welders. They say the equipment helps them turn out more and better work, and to do it more easily. The new equipment, plus improved production control, is credited by the management with these reductions: 75 per cent in cost per foot of weld; 60 per cent in welding time per boiler; 35 per cent in electrodes used; 70 per cent in power and maintenance cost.

The entire cost of the new equipment was returned in eight months.

377

20% Time Saving

Electric screwdrivers mounted vertically in bench stands are directly responsible for a 20 per cent time saving on an assembly job in a tool manufacturing plant.

The assembly of a bench plant requires the driving of a bolt in the knob and another longer bolt in the handle. When a tray of planes passes

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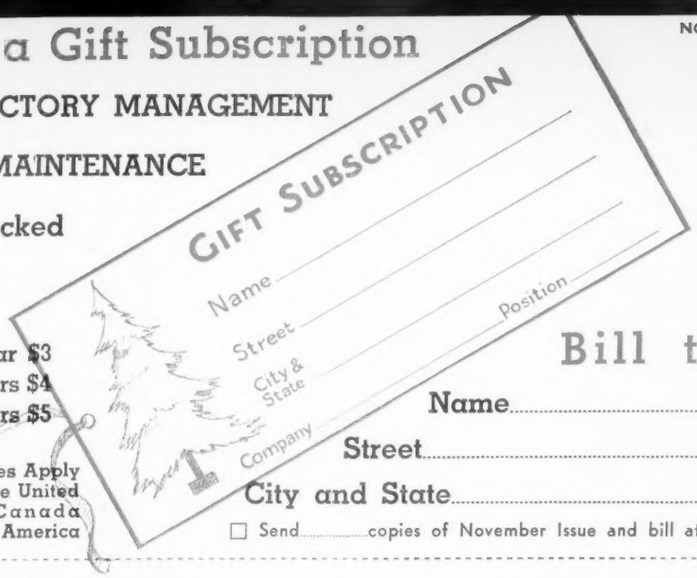

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under the screwdriver, the operator lowers it by means of a hand lever. The bit eases into the slot of the bolt and immediately starts driving it to a determined depth. When the bolt is seated, a clicking sound warns the operator. He raises the screwdriver, which is now ready to be lowered and put to work again on the next plane.

Old way was to drive the bolts with hand screwdrivers. New way not only saves time, but also reduces fatigue. And it has eliminated the frequent damaging of screw slots and plane parts.

378

400% More Output

Dies used in one plant in the manufacture of belt buckles were difficult to harden properly. Some cracked in service. Too many wore out rapidly. Investigation showed that with the manually controlled furnace used it was impossible for the heat-treater to exercise consistent and proper control of the operation. Therefore, a new furnace giving positive control of atmosphere, rate of heating and quench point, was put in. Average production of dies hardened in the new furnace is now about 400 per cent more than the former figure.

379

Last 985 Hours Longer

Collets holding bar stock being shaped in either automatic or semi-automatic machines, sometimes wear out within 14 or 15 hr. To eliminate shutting down machines so frequently, one company has found that if inserts of a wear-resistant alloy of cobalt, chromium, and tungsten are set into the steel collets they can be expected to give at least 1,000 hr. of trouble-free service.

380

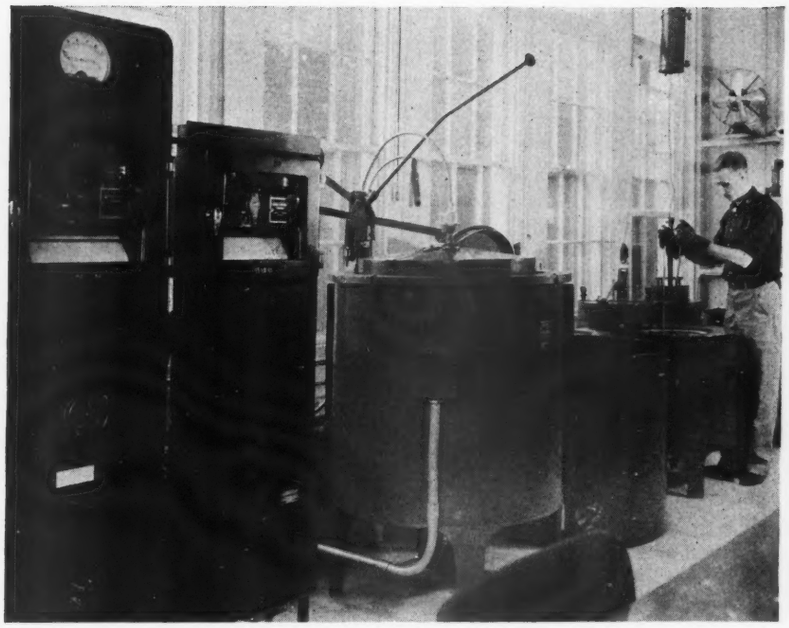
Fuel Cost Cut 57%

A manufacturer of switches, insulators, and other electrical fixtures rebuilt his 98x69x63-in. porcelain kiln with insulating refractory brick. Cost for material was $631, but heating time has been cut 60 per cent, hearth area increased 49 per cent, fuel cost per piece cut 57 per cent.

381

$1,500 Saved Many Times

Large, flat suspended arches in boiler furnaces were giving a bag and paper company trouble. Their average life was only eight months, and each renewal cost $1,500.



Since a belt buckle manufacturer switched to heat-treating furnaces with automatic control (item 378), he gets 400% more production from his dies

One bady spotted arch, eroded 4 in. deep in places, was treated with a stiff mixture of high-temperature cement and granular refractory aggregate, shot into holes and crevices with a refractory gun. The arch glazed over smooth as glass, and the plant superintendent reports a saving of $1,500. Now by veneering a ¼-in. coat of the mixture every five weeks, six arches are kept in excellent condition.

382

Cuts Cost of Cutter

Redesign of a small cloth cutter for the clothing industry made it possible for one manufacturer to save 20 per cent in rejections and 20 per cent in machining costs, plus a considerable amount due to the elimination of an expensive drop forging.

The parts are now stamped out and assembled by oxyacetylene welding, using a high-test steel rod.

383

They Last 5 Times Longer

Installation of special-type protective thermocouples on high-temperature (3,000 deg. F.) hydrogen atmosphere furnaces in the plant of the Raytheon Products Corporation, Newton, Mass., increased the life of heating elements more than five times.

With manual control of temperatures the furnace heating elements lasted only 500 hr., apparently because of overheating caused by the rise in voltage during the noon hour shutdown. Contamination by hydrogen made the use of conventional thermocouples impracticable.

Use of the new-type thermocouples has made automatic control possible, and the life of heating elements has been prolonged to 2,600 hours.

384

Just Enough Grease

Lubrication of automobile engine distributor parts manufactured by the Electric Auto-Lite Co., Toledo, has been speeded up and made more accurate by the use of a grease-measuring device. It dispenses exactly ⅛ oz. to each part, at the rate of 600 an hour.

385

133% Annual Return

Annual return on an electric scale-free-hardening furnace at Jacobs Manufacturing Company, Hartford, makers of precision drill chucks, is 133 per cent. The use of this heat-treating furnace has made possible substantial savings in material costs, practically eliminated spoilage, assured uniformity of harness, resulted in less warpage.

386

25% Less for Finishing

Use of a heat-treating furnace with positive control of its non-oxidizing atmosphere, rate of heating, and quench point, enabled a manufacturer of silverware to reduce the cost of

finishing heat-treated dies 25 per cent. The surface of the dies, as they come from the heat-treating operation. is now free from pits, scaling, and decarburization. Elimination of packing materials has also reduced handling costs.

387

Plastic Rails Stand Heat

Bottleneck in a textile finishing plant was tentering, where cloth stretched in processing is reset to the desired width. Speeding up was brought about by changing the drying effect. Around the tenter an insulated housing was erected, and heat exchangers and blower systems were installed to step temperatures up.

But maple rails along which the cloth passed could not stand the heat, and lasted only three to six weeks. A laminated plastic was tried. The original strips are still in service after more than four years. Their use has made it possible to step temperatures up still higher, increasing production and decreasing costs.

388

Less Chance to Gouge

Heywood - Wakefield Company, Gardner, Mass., speeds up production and avoids scratching and gouging of furniture during manufacture by using a new recessed screw.

In a typical assembly job on bent stretchers for chairs, the stronger support of the driver head in the screw lowers the pressure required to keep the driver in place and so cuts down the chance of slippage.

389

Bottles Are Dry Cleaned

New bottles are dry cleaned these days. Continental Distilling Co., Philadelphia, for example, has nine inverted air cleaners. Compressed air at 60-lb. pressure, thoroughly dried and twice filtered, is sure to remove every bit of foreign matter when released into an inverted bottle. Where water sterilization is not essential, a considerable sum of money can be saved.

390

Saves Time and Power

A large manufacturer of aluminum products had difficulty in drilling a 2⅛-in. hole, 24 in. long, in aluminum billets. The drill used was a special high-speed-steel, straight shank, two-lip design and frequent relieving was necessary to clear the chips.

Typical assembly job at Heywood-Wakefield Company (item 388), where use of a new recessed screw and power driver speeds production and avoids gouging

It was replaced with a high-speed, straight-shank, oil-hole drill 36 in. long. By slightly thinning the web at the point and putting chip breakers on the cutting lips, power consumption was reduced 20 to 25 per cent, and it was found possible to drill the 24-in. hole without stopping or withdrawing the drill.

391

Recovers Twice the Oil

A metalworking plant used to recover about 1 gal. of cutting oil from 100 lb. of chips by letting them stand until no more oil would drain off.

The amount of cutting oil reclaimed was raised to 2 gal. or more per 100 lb. by the installation of a centrifugal extractor. In addition, time required for recovering the oil has been reduced to a few minutes, and there is a considerable saving in the floor space formerly required for settling tanks.

392

One Way to Stop Corrosion

Corrosion of the cast-iron lining in a glucose steep tank was eliminated by replacing it with a phenolic-base coating. Steep water, with its 0.01 to 0.04 per cent sulphur dioxide content, is extremely corrosive and used to eat away the 1-in. cast-iron shell at the rate of ⅛ in. a year. Since the tank is 40 ft. high with a 9-in. cast-iron cone at the base, corrosion cost a considerable sum in dollars and cents.

After the interior of the wooden tank had been coated with the resin finish, it was tested for one year. At the end of this time it proved to be unaffected.

393

Uses Less Cleaner Now

Brewing company found itself with a problem because paper napkins wrapped around pop bottles didn't come off until the bottle washing process. This so loaded up the wash liquor that frequent changes were needed, wasting considerable quantities of caustic cleaning agents. Use of a cartridge filter now allows liquor to be drawn off and reused.

394

Weighs 8,400 Lb. Less

Through the use of arc welding the Electric Machinery Manufacturing Company, Minneapolis, reduced the cost of the stator ring and base of a 1,000-kva vertical alternator between 30 and 40 per cent, and the weight by 50 per cent. The fabricated ring weighs 8,400 lb., whereas a cast ring would have weighed approximately 17,000 lb.

395

Invests $75, Saves $1,150

A paper manufacturer had been using a small geared pump made of bronze, which cost $22.50 and had to be replaced every week.

Eventually a special-alloy pump costing $75 was tried. At the end of

eighteen months continuous service no wear could be detected. The saving is $1,150 annually, exclusive of the labor costs and delays formerly occasioned by installing a new pump every week.

396

Reduces Weight by Half

Weight of the frame for a dough divider built by the Baker Perkins Company, Saginaw, Mich., has been cut 50 per cent by the use of arc welding, as compared with the weight of the casting called for by the former design. For example, the panel for this frame used to be cast and weighed 300 lb.; now it is fabricated by welding and weighs 150 lb.

397

Costs Less to Operate

In making fine coated paper, one manufacturer has the problem of keeping lumps and solids from getting in it, thereby causing rejects. Vibrating screens formerly used to sift out foreign matter were replaced with filters. Cost of operation, including replacement of worn filter cartridges, is much lower.

398

Controls the Fuel Bill

After a foundry installed an air weight control instrument on its cupola, it was found that the quality of the castings was considerably improved, although the same mixture was used. And there was a large saving in coke. The effects of weather conditions on the operations of the cupola were entirely eliminated.

399

Costs Down, $230 to $73

In an attack on controllable expenses, monthly cutting-oil costs in one plant were reduced from $230 to $73 inside of four months. First step was to cooperate with the laboratory in the selection of a less costly oil. Second, splash guards were designed; they save oil and reduce the hazard of slippery floors. Third, the men designed a chip pan with a false-bottom drain, from which 20 gal. of oil is reclaimed each week. The oil was formerly separated at a central station, and adulteration made it unfit for high-grade work.

400

Triples Output, Less Fuel

Twist drill manufacturer rebuilt three gas-fired, heat-treating furnaces at cost of $100 each. Old furnaces had hearth area of 48x22 in., with walls of 4½-in. firebrick. Only two pans could be loaded in the center of the furnaces since uniform temperatures couldn't be attained around the sides. Each furnace consumed 126,200 cu.ft. of 530 B.t.u. gas monthly at $0.60 per 1,000 cu.ft.

Furnaces were relined with 4½ in. of new insulating refractory brick backed up with 2½ in. of refractory block insulation. Now six pans, or three times as much material, can be loaded, and gas consumption is down to 59,300 cu.ft. per month, a fuel saving of 66,900 cu.ft. or $40.14 per month.

401

Changed Design Saves 56%

A three-legged stand for a machine used in peeling vegetables cost $28.70, with the former method of construction. Change in design to welded steel cut the cost to $12.64, a reduction of 56 per cent.

402

From Weeks to Minutes

Use of a stroboscopic device, in the plant of a manufacturer of recording instruments, cut the time required to regulate clock movements from about two weeks to two minutes.

403

Costs Less, Half As Heavy

Weight of a sub-base for a small wire-drawing machine built by the Hilton Steel Company, Warren, Ohio, was cut in half when arc-welded construction was substituted for a casting. Cost of the fabricated base was approximately the same as that of the patterns required for the cast construction.

404

Adds $1,800 to Net Profit

A division of Inland Steel Company reports a saving of over $1,800 per year from hard-facing cutting bits. This saving resulted from increased bit life, decreased labor and material costs, and increased production.

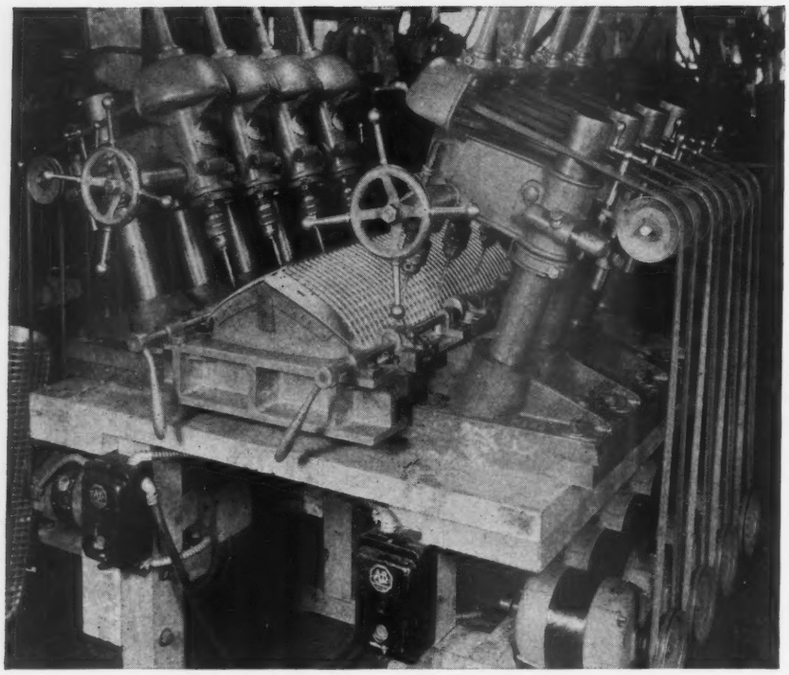
405

Returns Cost in 10 Months

The cupola in the foundry of one plant was designed so that the charging door was only 12 ft. above the baseplate. This construction gave a low coke ratio, 5 to 1. In addition, the low roof made working conditions extremely uncomfortable. Then the roof of the cupola building was removed, a charger installed, and the charging door raised 8 feet.

As a result of these changes the

Panel of dough divider frame made by Baker Perkins Company (item 396) used to be cast, weighed 300 lb. Now it's arc welded, weighs 50 per cent less



Low-cost multiple drill assembly (item 409) enables Doehler to answer varying needs as to number and location of holes to be drilled simultaneously

coke ratio was raised to 8 to 1, giving faster melting and hotter iron. The charging crew of eight men in summer and five in winter, was reduced to two men, and high labor turnover was eliminated.

It is estimated that the charger paid for itself through savings in coke alone in ten months.

406

$350 per Ton of Steel

With the steel formerly used by one manufacturer the cost of a small worm gear used in a stoker was $21.40 per 100 lb., exclusive of machining operations. The bulk of this cost was incurred by the carburizing operation, followed by cleaning and grinding.

Adoption of a special, cold-finished steel costing $1 per 100 lb. more, made it possible to eliminate these operations and show a saving of $18.50 per 100 lb. The net saving is therefore $350 per ton of steel used.

407

From 10% to 1% Rejects

By replacing the thermocouple pyrometer formerly used with a special protected thermocouple, the Farrington Manufacturing Co., Boston, reduced the number of rejections of springs treated in a gas-fired, spiral-retort, hardening furnace. Formerly quench temperatures often varied more than 100 deg. F., while rejections sometimes exceeded 10 per cent. The average number of rejects is now less than 1 per cent.

408

Five Times Faster

In the gear case of the Skilsaw, made by Skilsaw, Inc., Chicago, there are four ball bearings and a precision-made worm and gear that must be lubricated during assembly. A power-operated grease gun does this lubricating five times as fast as was formerly possible.

409

Multiple Drilling to Fit Varying Needs

Frequent changes in the number and location of holes to be drilled simultaneously, present a problem which the Doehler Die Casting Company has solved in an economical and satisfactory way.

A large number of low-cost drill presses are kept on hand, because these presses can be taken apart and various combinations of the individual elements reassembled to make cheap but perfectly satisfactory multiple-drilling set-ups.

For example, a unit for drilling and counter-boring eight holes in an automobile radiator grille was assembled by arranging in two banks the head frame spindles and center posts of eight drill presses. The spindle feed pinions were linked with standard couplings, and a handwheel mounted at the end. Motors were mounted under the wooden table.

The only parts that had to be constructed were the wooden table and the cast-iron base with the fixture for holding the work. Quality of work and speed and convenience of operation are entirely satisfactory while the cost of the assembly was low. When needed, the parts can easily be reassembled into a different set-up.

410

Ten Times the Life

Cement manufacturer reports that hard-facing clamshell bucket lips increased their life by ten times. Unsurfaced lips last only six months, but addition of hard-surfacing alloy increases their life to approximately five years.

411

Rejections Down to 2%

Use of a special water-cooled, seven-flame oxyacetylene tip for flame hardening automobile valve stems enabled one manufacturer to cut rejections due to non-uniformity from 15 per cent to 2 per cent. In an eight-hour day this concern treats about 7,000 valves.

412

No Cinders in His Soap

Manufacturer of fine toilet soaps improved their quality by installing two filter units. Until he examined the residue in the filter he didn't know that such things as cinders, pipe scale, and fibrous material had been going into his product.

413

Pays 6% Every 130 Min.

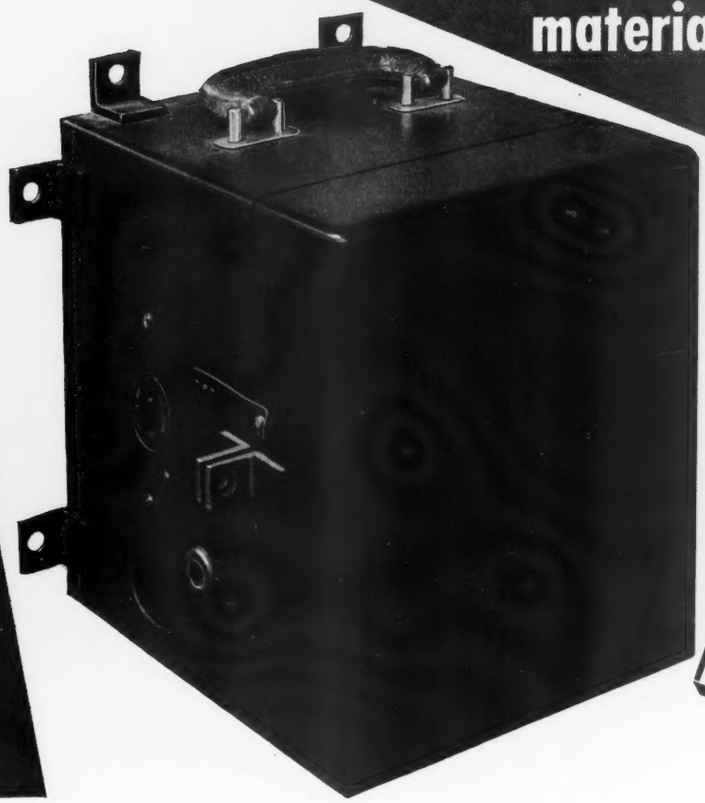
A manufacturer equipped a milling machine for cast-iron valve bodies with carbide cutters valued at $138.48 each, representing a total investment of $276.96. These cutters paid for themselves in the first 36 hours of use. The total saving is $1,607 per operating month, which means a 6 per cent dividend every 2 1/6 hours.

414

Now Oil Costs Half

Light lubricating oil used for engine testing is cleaned for re-use by passing it through cartridge filters. Cost of oil is now less than half of what it was before filter installation, and maintenance is reduced because lines need not be blown so often.

Exide's "little black box" will throw new light on your material handling jobs



Exide IRONCLAD BATTERIES With Exide MIPOR Separators "MIPOR," Reg. U. S. Pat. Off.

WHAT are the true battery requirements of each material handling job in your plant? Until now, there has been no easy way to find out, no definite guide as to the type and size of battery really needed to get the utmost efficiency from your electric industrial trucks. There's a surprising improvement to be made in many handling jobs, and a careful analysis can show the way.

With this "little black box" and an odometer, Exide can determine exactly the amount of power required to operate the truck throughout an entire working shift on one charge. It enables us to recommend just the size and type of battery that will operate the truck at high speed throughout an entire day, eliminating delays and tow-ins, and assuring you dependable day in and day out service on the most economical and efficient basis.

Why not let Exide make such an analysis of your material handling jobs and submit a full written report of the findings? There is no obligation.

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

To mark the fiftieth anniversary of Exide Batteries, a handsome souvenir booklet has been prepared, illustrating the essential part these batteries play in daily life. Write, and we will gladly send you a free copy.

MATERIALS HANDLING, LAYOUT AND MOTION ECONOMY

(CONTINUED FROM PAGE 64)

Kohler, Wis. In 178 working days this crane returned savings of more than $13,000 on such jobs as handling cinders, sand, coal, clay, loading brick, and making excavations.

415

Charge Cupola for $1,260 Less

To charge car-wheel scrap into a cupola, Brass Foundry & Machine Company, Fort Wayne, Ind., installed an air hoist. The loading crew is able to average 30 wheels per hour, whereas former output ran from 15 to 20. Labor costs have been reduced $1,260 a year.

416

Saved 10c on the Handling Dollar

Materials handling cost J. R. Bunting Company, Philadelphia, less after it installed an overhead monorail conveyor. Savings of 10¢ on the materials handling dollar and the labor of 7 men were noted, and in addition 1,500 sq.ft. of flow space was cleared and congestion eliminated.

417

Cuts Loading Costs 80%

A manufacturer of metal products now straps them in a bundle to a skid. This change resulted in reducing carload loading costs from $1 a ton to less than 20¢, or an average saving of $24 a carload.

418

Two-Hand Inspection

Two small go-no-go gages mounted on the table make washer inspection a two-hand instead of a one-hand job in an electrical manufacturing establishment. Pieces are fed from openings in bins. Chutes at gages permit drop delivery of good parts; chutes in front of operator take oversized and undersized parts.

419

Faster and Surer Weighs

Errors in reading and recording weights were eliminated, and time required to make 1,000 visual scale readings per day was saved when Whitin Machine Co., Whitinsville, Mass., installed an automatic printing scale.

Problem was to weigh and record castings as they left the foundry, for men who clean and finish castings are paid by weight. The old method of weighing finished castings in barrels on a built-in scale was unsatisfactory.

Now each man places each lot of castings in a metal pan, along with an identifying ticket, and the pan is carried by gravity on a roller conveyor to the scale. As pans approach the scale, the operator releases a foot lever that allows but one pan at a time to move onto the conveyor section, attached to the scale platform. When the pan comes to rest, the operator inserts the ticket into a slot on the scale and presses a button; the weight is automatically printed.

420

$10,000 Saved in Materials And Labor

Elimination of a wire-bound box containing six cartons enabled the manufacturer of a cleaning compound to save $10,000 in material and labor in the first eight months of this year. The six cartons are now stacked on pieces of 7/8-in. lumber in two rows of three cartons each, and bound together with steel straps.

These bundles are easier to handle

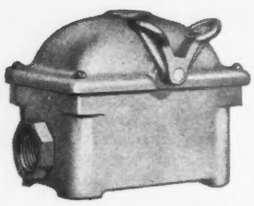
E&M

PUSH BUTTONS

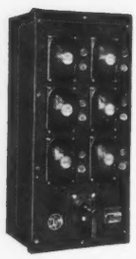
For automatic motor starters, controllers, lighting circuits, etc. Standard, vapor-proof, explosion-proof, dust-tight and water-tight.

Type EO Explosion-proof Push Button (Oil-Immersed or Air-Break) Provision for padlock to lock in "off" position is furnished as standard.

STANDARD TYPE J PUSH BUTTON



VAPOR-PROOF PUSH BUTTON



Splash - proof Push Button Control Station for machine tool.

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HEAVY DUTY MOTOR CONTROL FOR CRANES, MILL DRIVES AND MACHINERY • BRAKES • LIMIT STOPS • LIFTING MAGNETS AND AUTOMATIC WELD TIMERS

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2688-F East 79th Street, CLEVELAND, OHIO
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Please send me your Bulletin 1105-A on EC&M Push Buttons.

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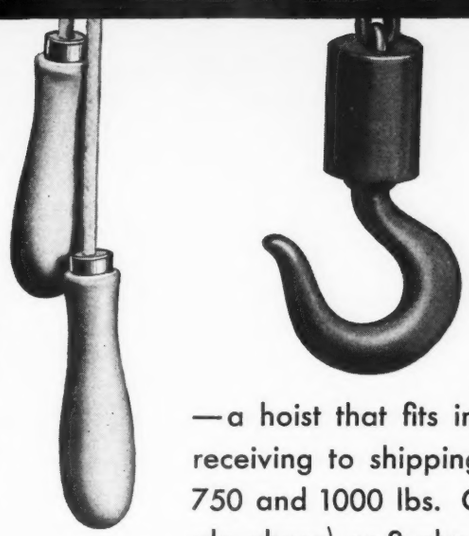
You're READY to hoist!



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LIGHT WEIGHT
Easily portable from one spot to another; quickly installed; controlled with one hand.

★

HEAVY DUTY
Designed to stand the "gaff" of continuous exacting hoisting operations. Quality built throughout.

★

THRIFTY
Low first cost—then just a few cents a day to run. Pays for itself in effort saved.

★

VERSATILE
Every plant, every department has a spot where COMET efficiency is called for.

Put an end to those hundred and one lifting jobs that tire out workmen and cut down efficiency! For a minimum investment and at slight operating cost, you can have electric hoist speed and efficiency. The NEW COMET is the answer —a hoist that fits into your plant right through from the receiving to shipping department. Capacities: 250, 500, 750 and 1000 lbs. Operates on ordinary light circuit (single phase) or 3 phase power lines. Literature on request.

CHISHOLM-MOORE HOIST CORP.
(Division of Columbus-McKinnon Chain Corp.)
130 FREMONT AVENUE TONAWANDA, NEW YORK

CM COMET

than the old ones, have eliminated the cost of the container, and reduced freight charges.

421

Machine Packing Saves Them $6,000 a Year

A manufacturer of pharmaceutical products formerly hand-packed individual cartons of toothpaste in counter display cartons.

After bundling machine had been installed, study showed that it was effecting a saving of approximately $6,000 a year, although its output was limited to about 40 per cent of capacity by the small output of preceding cartoning machines.

Under these circumstances the net return on the investment is 107 per cent, and cost of the operation has been reduced 46 per cent.

422

Loading Cut from $4 to $2

Loading pebble gypsum in box cars by hand meant a labor cost of approximately $4 per car for Nepoli Plaster & Manufacturing Company in Salt Lake City. When a power loader was put on the job, loading time was cut in half, and it was found no chargeable labor cost remained.

423

No Wasteful Rehandling Here

By providing "through traffic" of finished materials—with filled cartons moving in unbroken lines from sealers to freight cars or stockrooms—conveyors have eliminated wasteful rehandling for a wax manufacturer.

Five lines of gravity roller and belt conveyors deliver cartons from the production machines to a central terminal. Here they are switched to a trunk-line conveyor which carries them directly to waiting freight cars or to either of two stockrooms.

424

Upped Output 40%

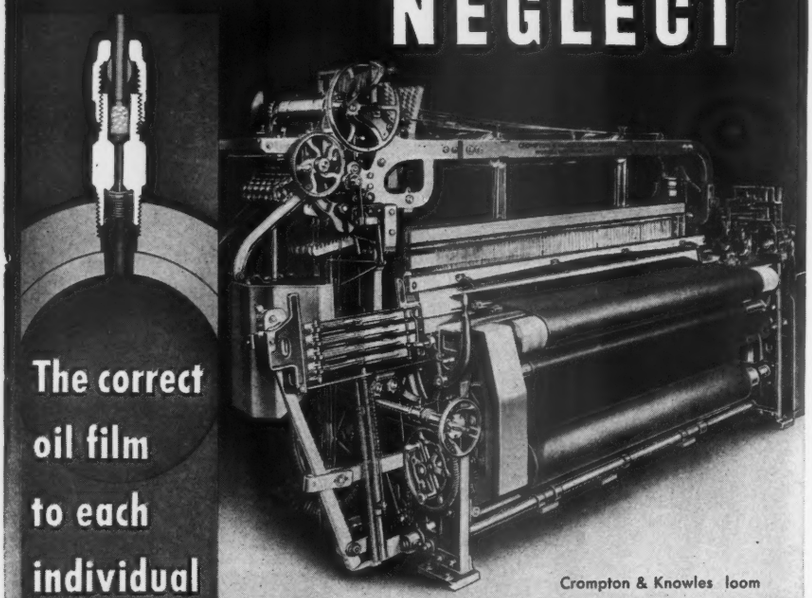
With costs steadily rising and molders hard to find, a foundry installed a sand-handling system, and with the same force of molders, increased outputs 40 per cent by eliminating time spent in shoveling sand and carrying molds.

425

Stock Never Overheats on This Steam Table

At the American Hard Rubber Co., Butler, N. J., stock had to be constantly turned by hand to prevent overheating on a steam table. So a motion-economized steam table was set up on an incline. When a piece of stock is removed from the bottom, all the others roll down, making a complete turn with every three pieces removed.

INSURING YOU AGAINST NEGLECT



Crompton & Knowles loom

The correct oil film to each individual bearing... automatically

BIJUR

AUTOMATICALLY Correct LUBRICATION

● Expensive "I-forgot's"... the faults of any imperfectly controlled method of lubrication... may heavily burden maintenance and production costs. A BIJUR lubricating system unfailingly protects your machine against such neglect... Insures, too, the soundness of your investment. Each bearing... whatever its size, speed and load...is automatically fed the amount of oil it individually requires!

BIJUR LUBRICATING CORPORATION LONG ISLAND CITY, NEW YORK

705

POWER AND LIGHT

(CONTINUED FROM PAGE 72)

mum return it is necessary to consider: (1) Condenser cost per reactive kva.; (2) terms of power factor clause in power contract; (3) plant demand; (4) return desired on the investment.

It is a simple matter to compare the return at various power factors, and thus determine the point of maximum return.

426

Less Current, More Light

Complaints about the lighting lead to the discovery that the intensity in one department of a pharmaceutical plant varied from 6 to 17 foot-candles.

When rustable piping needs replacement...cut your annual COST with Anaconda Copper Tubes

ANACONDA TYPE K
Anaconda Copper Tubes are phosphorous-deoxidized to increase corrosion resistance and improve physical properties.
Anaconda Fittings have deep cups to give long, strong bonds and more support for tubes.

For the industrial plant, Anaconda Copper Tubes and Fittings are a money-saver when rustable piping needs replacement or when new piping is required.

In the smaller sizes most generally used, the installed cost of these durable tubes and "solder-type" fittings is hardly any more than rustable piping.

Use this modern piping for:

Plumbing and Heating: Hot and cold water lines. Hot water heating lines. Fire sprinkler systems. Fuel lines.

Refrigeration and Air-Conditioning: Refrigerant circulation lines. Humidifying apparatus.

Mechanical Uses: Pressure lubricating systems. Hydraulic pressure lines (low pressure). Circulating lines for lubricants. Low pressure air lines. Pump equipment. Conveying lines for many liquids.

Process Uses: Pipe lines for Breweries, Distilleries, and Wineries; Textile Mills, Paper Mills, Sugar Mills, Chemical Plants, etc. 3842-A

Free Reference Handbook on **Seamless Flexible Metal Tubing—**

The most dependable *flexible* connector for conveying liquids or gases under high pressures . . . made from high tensile strength *seamless* Bronze Tubing. Handbook contains full descriptions and valuable engineering data. Write for Bulletin SS-3.

A complete line of Anaconda Copper Tubes, and both "solder-type" and flared type fittings, is readily available from supply houses throughout the country.

ANACONDA
Iron mine to consumer

Anaconda Copper Tubes

THE AMERICAN BRASS COMPANY, General Offices: Waterbury, Connecticut

In Canada: Anaconda American Brass Ltd., New Toronto, Ont. • Subsidiary of Anaconda Copper Mining Company

Tests showed that lighting units of more modern design would give an intensity of 9 to 12 foot-candles, with a saving of 2,000 watts in that department alone.

427

Localizing Motor Troubles

Instead of running a group of feeders from the substation, each of which supplies all the motors in a given area, one large plant has found that it pays to carry motor circuits back to the substation switchboard, where each is protected by a circuit breaker. Substations are located so that no circuit is longer than 250 ft. Advantages are that all circuit protective equipment is in one place, thus saving time in locating fuses or breakers, and any trouble that develops is confined to one circuit.

428

Off-Peak Power Saves $6,500

A concern that formerly generated all its own power found that changes in its requirements for process steam and power, and in the rates for purchased energy, made it desirable to buy instead of generate power. Total cost of purchased power averaged $19,000 a year.

Later new rates for peak and off-peak power were put in effect. Study showed that if the plant did not consume any power between 4:30 and 7:30 p.m. during the winter months, but supplied its requirements from its own generating plant, there would be a saving of more than $6,500 a year.

429

Stoker Earns $1,500 a Year

Nearby low-cost fuels, stoker-fired, could be used more economically than hand-fired, high-grade coal, decided Hoopeston Canning Company, Hoopeston, Ill. Fuel costs over several years had averaged $7.17 per thousand cases of corn. And the company normally packs 400,000 cases in the canning season.

Three stokers were installed, and a low-grade coal from a field 25 miles away was adopted. Steam costs per thousand cases promptly dropped to $3.82. In addition, one man was dispensed with in the boiler room, and total saving per thousand cases was estimated at $3.85, or a total saving of over $1,500.

430

Leveled the Peaks and Cut Demand 64%

A small plant had a demand charge of about 50 kw., based on a 15-min. interval. This charge seemed unduly high, so a study was made of the operation of the equipment. The largest current consuming devices are a 25-hp. motor and a 30-kw. electric oven. High peaks were produced when both were operated at the same time.

To prevent simultaneous operation an auxiliary contact was put on the motor switch, which serves to lock the oven out when the motor is running. Normally the motor is used only one or two times an hour, for a few minutes at a time. Therefore, a timing relay was put in the oven control circuit which permits the oven to draw current for 7½ min. out of each 15-min. period. All of which made it possible to reduce the demand about 64 per cent.

431

25% Easier on the Power

A large electrically heated enamel baking oven in an automotive parts plant, although controlled by a thermostat, would occasionally get too hot, spoiling the work and wasting

LET'S CLEAR UP THIS FOG

...about material handling!

There are a number of methods of handling materials. The electric truck is one way . . . There are a number of electric trucks. The Baker is one . . . No two material handling jobs are exactly alike. For every job there is one best and cheapest way of doing it . . . Some jobs (not all of them, of course) can be handled best by electric trucks. Certain of these jobs can be handled best ***only*** by Baker Trucks . . . Which means that it's a good idea, never to buy ***any*** material handling equipment without a full and intelligent analysis of facts . . . not through hunch, personal preference or friendship.

The greater bulk of our sales is to old customers . . . who buy additional Baker Trucks because Bakers have proven, in their plants, the savings they can make.

Baker representatives are experienced material handling engineers. They spin no fairy tales. They are able and willing to analyze, thoroughly, a material handling job and then give you the facts. If, and only if, those facts point to a Baker, will you be told so.

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Doc. Steelstrap's BULLETIN

Issued by ACME STEEL COMPANY, Chicago, Illinois

ACME STEELSTRAP PROVIDES NEW "WAYS TO PROFITS" FOR 20,000 USERS

USE THESE TIME- AND MONEY-SAVING PRACTICES

Whether you ship your products in wooden containers, cartons, bundles, on skids or in special wrappings, chances are 10 to 1 you can make worth-while savings by using Acme Steelstrap. Shipments made by over 20,000 Steelstrap users include practically every type of product.

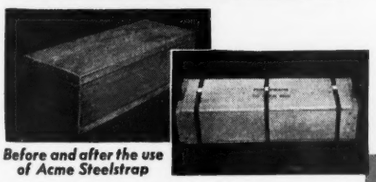
Acme Steelstrap makes "Bound to get there" packs—material, labor, time and costs are reduced—pilferage is eliminated and damage claims are lowered. Savings from 10% to 40% are not uncommon.

Saved $10,000 thus far in 1938

The use of Acme Steelstrap enables a cleaner manufacturer to eliminate the old pack for dealer cartons. Thus far in 1938, *ten thousand dollars* have been saved in material and labor alone.

Six cartons are *now* stacked (on cut-to-size 7/8" pieces of lumber) in two rows of three cartons each and strapped with 3/4" wide Steelstrap. These strapped bundles are easier to handle, save the cost of the outer container and effect an additional saving in freight on tare weight.

You, too, may be able to reduce your shipping costs by 25%

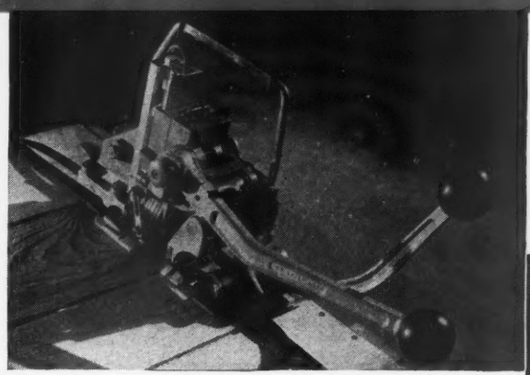


Before and after the use of Acme Steelstrap

You may be able to make even *greater* savings than the shipper of the box shown above. The weight reduction was 31%—and 40% less lumber was used. The total saving amounted to more than 25% for a container that was stronger and safer.

SAVES LABOR

By changing to an Acme Steelstrapper, which combines tensioning, sealing and cutting operations—and mounting this tool to a conveyor, a shipper of plastic firebrick saved the labor of one out of four packers. Three men now pack, steelstrap and ship more cartons (100 pounds each) per day with less fatigue than four men did formerly with old-type hand strapping tools.



NEW ACME NO. 2 STEELSTRAPPER NOW AVAILABLE

New Features Make Further Shipping Economies Possible

Now ready: the latest addition to the only line of strapping equipment which *combines* the tensioning, sealing and cutting operations with an automatic seal feed! Made to eliminate lost motion and provide additional economies, Acme Steelstrappers are built for speedy, steelstrap application. Designed for easy operation, one lever tensions while a single stroke of the other cuts the strap from the coil and makes a positive "Bound to Get There" sealed joint.

Automatic Seal Feed is an Exclusive Acme Feature

The automatic seal feed saves the time of applying seals by hand. Seals in clips of fifty or one hundred are placed in the magazine and as many Steelstraps applied without reloading.

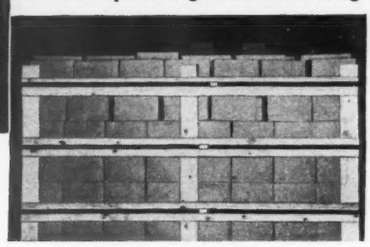
SAVES TIME AND CRATING COSTS

The Acme *Skid Idea* incorporates the use of non-returnable wood skids on which products of many types are quickly and effectively secured with Acme Steelstrap. Handling, storing, loading and unloading cars, etc., are easier and faster.

In addition to lowering costs, the Acme Steelstrap method reduces hazards to workmen and eliminates damage to products in transit.

POOL AND STOPOVER CAR SHIPPERS MAKE BIG SAVINGS WITH ACME'S UNIT-LOAD SYSTEM

The Acme Unit-Load System makes possible the elimination of unnecessary and costly bracing materials. Savings



are made on freight charges. Labor costs are lowered. Strong steel bands protect each section of the car from damage in transit and prevent mixups at the buyer's sidings. Loading time is lessened and material costs are reduced. Shipments for several customers are securely strapped in individual units, in this *approved* method of bracing, thereby avoiding the possibility of delay and loss. Unloading is easier and safer. The consignee merely snips the straps on his portion of the car. There are no nails to pull, no bracing to replace or mishandle.

Find out how you can benefit by these "Ways to Profit"

Illustrated booklets describing the money- and time-saving advantages of Acme Steelstrap—Acme Unit-Load System or Acme Skid Idea—will be sent on request. Mail the coupon today. There is no obligation and it may be the means of effecting important economies.

Acme Steel Company
2831 Archer Avenue, Chicago, Illinois
Please mail a copy of the
- ☐ Acme Steelstrap Booklet
- ☐ Acme Unit-Load Booklet
- ☐ Acme Skid Idea Booklet

☐ Send me particulars about a free diagnosis of our shipments.

☐ Add our name to the list to receive Doc Steelstrap's Bulletins on advanced shipping and packing practice.

Name.....

Address.....

City.....State.....

energy. No cause for the trouble could be found until a graphic voltmeter was connected across the magnetic switch which is operated by the thermostat contact, and a graphic ammeter was put in the heater circuit.

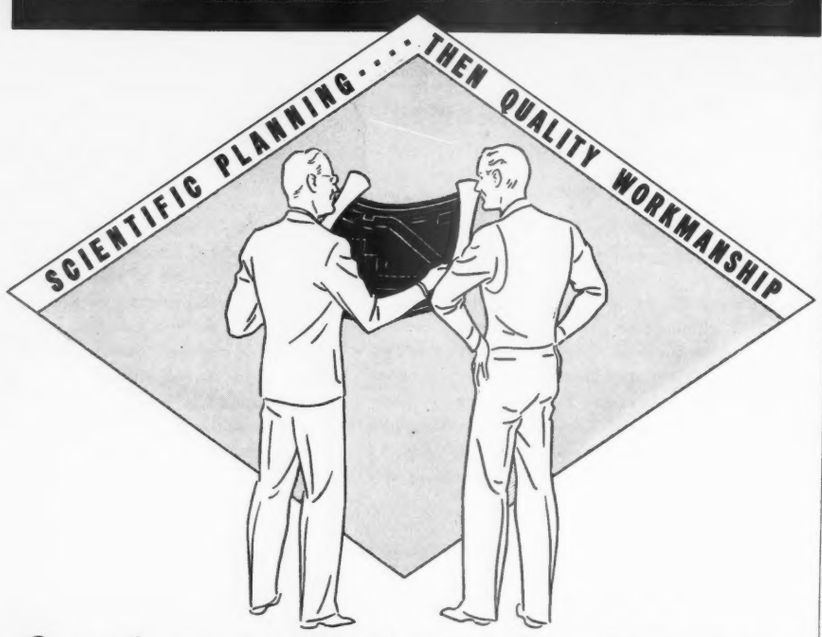
The charts showed that the thermostat contacts were in poor condition and that a ground in one phase of the heater circuit was increasing energy consumption about 25 per cent. When the obvious remedies were applied, there was no more trouble from overheating, and a substantial dollar saving was therefore made in power consumption.

MECHANICAL POWER DRIVES

(CONTINUED FROM PAGE 78)

made it almost impossible to lubricate the gears properly, and the presence of large amounts of abrasive dust led to rapid wear. Under these conditions excessive noise and vibration were inevitable. A silent chain drive inclosed in an oil-tight casing problem. Maintenance costs have been greatly reduced since installation.

This ALVEY-FERGUSON SERVICE IS NOT INCLUDED IN SPECIFICATIONS



Our Conveyor Engineers Can Help You Speed Your Production . . . Lower Your Costs!

● Do *you* have product-handling problems? Our staff of expert conveyor engineers, backed by thirty-seven years experience, can help you solve them. A consultation costs you nothing and may save you hundreds of dollars. Write for our booklet "Scientifically Planned Conveyors" containing information you'll find most valuable.

WRITE FOR THIS BOOKLET—*TODAY!*

THE ALVEY-FERGUSON COMPANY
SOUTH & DISNEY STREETS CINCINNATI, OHIO

432

For Longer Belt Life

Keeping leather belts soft and pliable through the use of a good dressing is essential to long life and maximum service. It is also an effective means of eliminating or reducing trouble from static charges.

433

A Split Lineshaft the Cure

Flexibility of operation of a lineshaft drive and proper loading of the motors were secured in one plant by dividing the shaft into two sections, joined by a coupling. When only part of the machines needed to be operated, the two sections are driven by one motor. At times when full production is required, the coupling is disconnected and the two sections of shaft are operated separately, each being driven by its own motor.

434

Earn a 45% Return

After ball bearings had been installed in place of the plain type on lineshafts from which a battery of automatic screw machines were driven, power bills were reduced about $225 a year. With the lower maintenance and lubrication costs, the total saving is about $271 a year, representing a return of 45 per cent on the investment.

435

Cuts Maintenance Cost

Replacement of a large number of ordinary bearings on lineshafts and loose pulleys with the self-lubricating type has enabled one plant to make a decided reduction in lubrication and maintenance costs. The old bearings required lubrication every week or two, whereas some of the new type have run for more than a year without any attention.

436

Keep Pulley Diameters Large

When laying out belt drives it is advisable to keep pulley diameters as large as possible, in order to get belt speeds of 3000 to 4000 f.p.m. and make it possible to use narrower belts than might otherwise be required.

437

Load Down, Power Factor Up

In Providence a paint manufacturer reduced his connected load and brought power factor up to 79 per cent (without use of other corrective apparatus) by installing friction clutches on each pigment-mill drive,

WASTED TIME—at $20.00 AN HOUR!

Tractor breakdowns kept equipment idle... when minutes meant dollars

THE HOBBS-WALL LOGGING COMPANY, of Crescent City, California, were watching profits dribble through their fingers. Their Diesel tractors were breaking down, causing delays and keeping equipment idle at an estimated cost of $20.00 per hour! Shell engineers went to work with Kenneth Cunningham, tractor engineer, and Charles Martin, woods superintendent.

The Hobbs-Wall tractors, used for dragging heavy logs over rough ground and working at extremely high temperatures, were breaking down due to heavy sludge formation and sticking rings and valves.

After noting all operating conditions and making a thorough examination of the Diesels, Shell engineers recommended the proper Shell Lubricant.

The Hobbs-Wall Company found immediate satisfaction. They report engines "operating cooler" with no more valve and ring sticking. They further claim a substantial saving in lubricants alone. More important—delays which were formerly so costly have been completely eliminated!

• • •

This case history from the Shell files is important to you. It is but *one* example of the way Shell men are getting *results* with Shell Industrial Lubricants. Shell has a mighty big "plus" to offer you. Hard-headed, practical experience coupled with the finest lubricants on the market today. This "plus" is always ready to meet *your* problems. Call or write your nearest Shell office.

SHELL

SHELL DIESEL LUBRICANTS

which permitted starting one mill at a time. Power savings almost immediately returned the capital outlay.

438

Right Lubricant Saves $268

Change from one lubricant to another meant a big saving to one manufacturer when tests showed that the material used was not the proper lubricant under the conditions. Savings in cost of lubricants in one department came to $268.20 in a year.

In another department, bearings that used to require regreasing three times a day now need to be checked only every 10 or 12 days. Not only has there been a big saving in lubricants, but a much greater saving in labor and upkeep charges.

439

Air Out Stops Oil Leakage

Leakage of oil or grease from gear cases can often be stopped by relieving the slight air pressure built up by the rise in temperature due to operation. This may be done by drilling a small hole in a plug in the top of the case or, preferably, by mounting vertically a short piece of pipe in the top. If a pipe is used, it should be screened or turned over in a reverse bend, to keep out dirt.

440

Damped Machine Vibration

Vibration of a blower in the plant of the Indiana Ox Fibre Brush Company, Seymour, Ind., created a serious problem. This blower, which weighs about 1,000 lb., is belt driven by a 15-hp. motor. It is mounted on a raised platform and vibrated so badly as to cause deterioration of the building structure, and make the floor space above unfit for use.

Mounting the blower on eight 3-in. rubber-to-metal insulators of the double shear type damped the vibration to a point where it is no longer objectionable.

441

Drives in Trenches Easy to Maintain

Not the least of the advantages afforded by putting group drives under the floor is considerably reduced maintenance on the lineshafts, and the much greater accessibility. With one installation, to get at the hangers for inspection or lubrication it is merely necessary to lift up the belt guard and the trench cover to which it is welded. Hangers are placed close to the machine pulleys and can be inspected with a minimum of time and effort.

442

Comb Box Chatter Removed

Chatter and vibration in comb boxes was eliminated by a change of lubricant, in the plant of a textile manufacturer. Also power consumption was decreased.

The boxes were badly worn and before the change it had been planned to replace them. After changing the lubricant, however, need for replacement vanished, because they operated as smoothly as ever.

443

For Tight Vertical Belts

Several considerations, including limited space available on the floor, led the engineers in one plant to mount a number of motors above the driven machines, making necessary the use of a vertical belt drive. As often happens with such drives, there was much difficulty in maintaining proper belt tension.

Various expedients were tried, but a satisfactory solution was not found

RYERSON R CERTIFIED STEELS

"Guide to Treatment" Shipped With the Steel

Ryerson Certified Alloy Steels are not only shipped quickly, but complete information arrives with the bars, including chemical and physical properties and record of heat treatment results. In this way, the heat treater knows what is in each alloy and exactly how to treat it for the best possible results.

This unique alloy plan, never before attempted by any steel service company, is the outstanding feature of Ryerson Certified Steels.

Ryerson Certified Carbon Steels, Tool Steels and Stainless Steels are ordered to exacting specifications and pass rigid inspection before they are accepted for Ryerson stock.

For high, uniform quality, specify Ryerson Certified Steels. They cost no more and quick shipment is assured.

STOCKS INCLUDE
Alloy Steels—Tool Steels
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Cold Finished Shafting
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Cold Finished Flats
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Beams and Structurals
Channels, Angles
Tees and Zees
Hot Rolled Bars
Hoops and Bands
Rails, Spikes, Bolts, etc.
Plates—Sheets
Boiler Tubes and Fittings
Mechanical Tubing
Welding Rod
Rivets, Bolts, Nuts, etc.
Reinforcing Bars
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JOSEPH T. RYERSON & SON, INC. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON

PAINT THAT'S formulated TO FIT THE WORK IT MUST DO

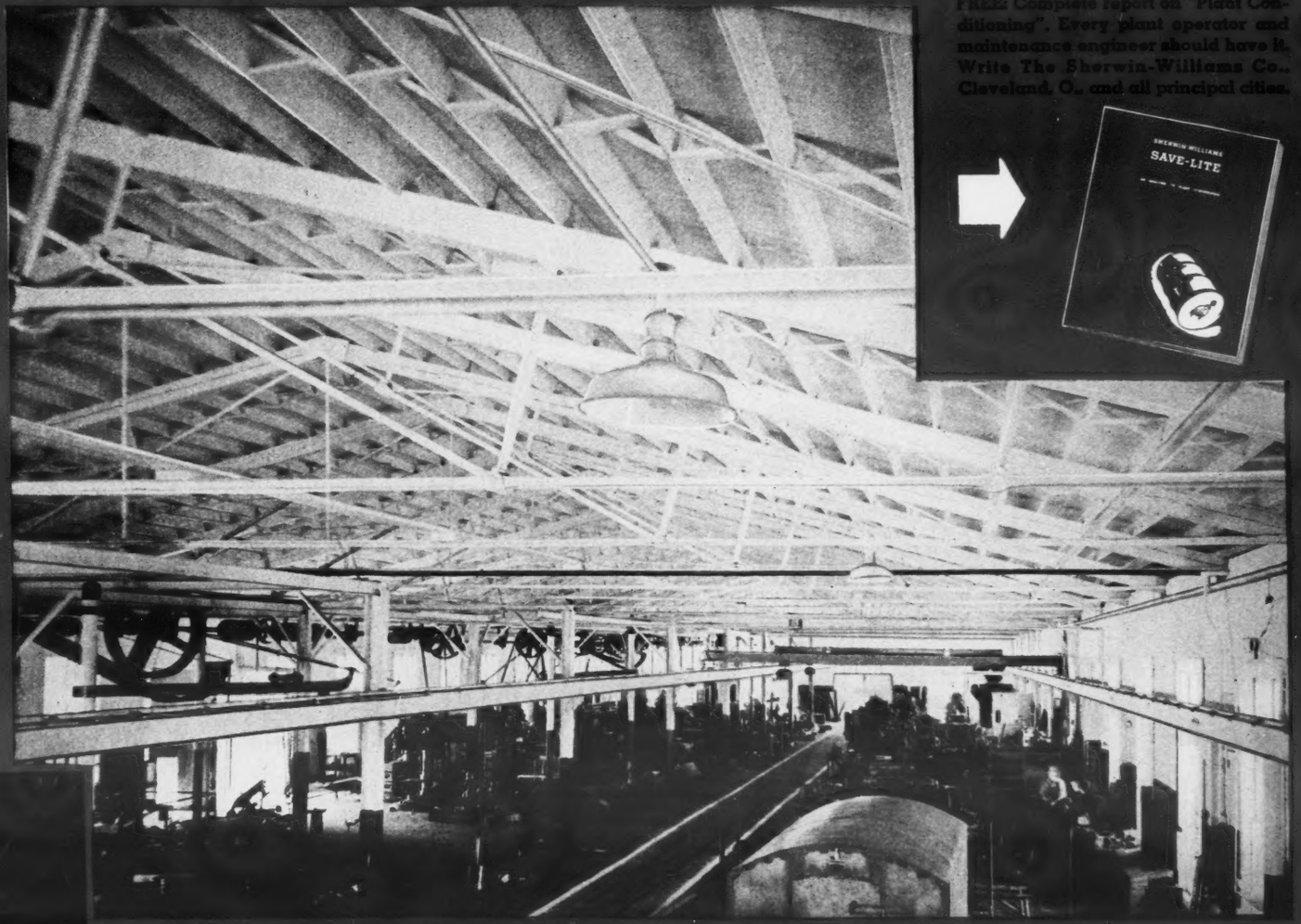
PAINT THAT'S *formulated* TO FIT THE WORK IT MUST DO

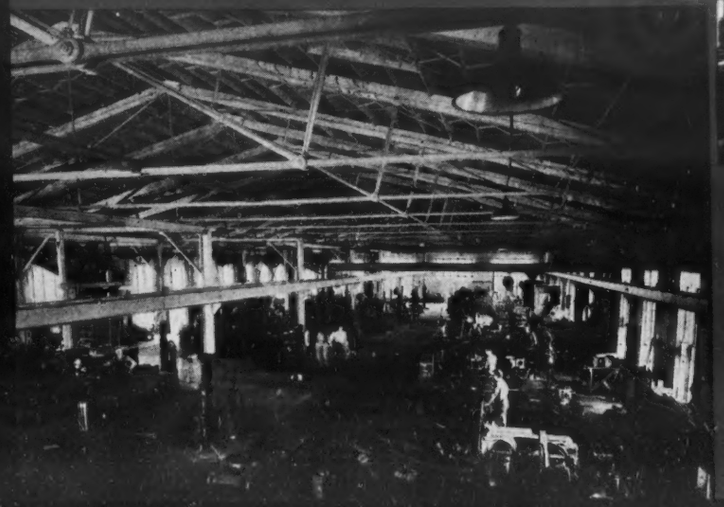
Your plant presents a variety of conditions that the interior paint you use must meet. In some sections, heat may be your problem. In others, fumes. In many, heat and fumes combine to destroy paint . . . discolor its whiteness. And then you have the problem of "general" plant painting.

No one, single white paint made can solve all these problems, efficiently or economically. That's why Sherwin-Williams Save-Lite comes in special types—each type specially formulated to do its specific job better, for a longer period of time and at lower cost.

The Sherwin-Williams Painting Engineer will gladly help you choose the exact type of Save-Lite proved best for each and every part of your plant. He has had a wide experience with plants just like yours. There will be no obligation.

THE PICTURES SHOW THE DIFFERENCE in cleanliness and light that Sherwin-Williams Save-Lite makes in the plant of Bridgeport Machine Co., Wichita, Kansas, manufacturers of oil field equipment.





FREE: Complete report on "Plant Conditioning". Every plant operator and maintenance engineer should have it. Write The Sherwin-Williams Co., Cleveland, O., and all principal cities.

SEE THE SHERWIN-WILLIAMS PAINTING ENGINEER

SHERWIN-WILLIAMS SAVE-LITE

THE PLANT CONDITIONING PAINT

until the motors were mounted on a pivoted base designed to maintain automatically the proper tension in vertical-drive belts.

444

Jumped Capacity by Half

Owner of a flour mill found that the waterwheel had insufficient power, and it was believed that it would have to be replaced with a larger one.

Before this change was made, most of the plain bearings in the mill were replaced with anti-friction bearings. The resultant reduction in friction not only made the capital investment in the new waterwheel unnecessary, but also added enough power to increase the mill's capacity from 50 to 75 barrels.

445

Limit That Misalignment

Flexible couplings will take care of a certain amount of shaft misalignment, but if the limits recommended by the manufacturer are exceeded, the couplings and probably the bearings of motors and driven machines are likely to suffer. It is usually a simple matter to check the alignment of the shafts by placing a straightedge across the flanges of the coupling, at the top, bottom, and sides. This check should be made frequently enough to insure that misalignment of the shafts has not exceeded its original limits.

446

Both Unit and Group Drives

Experience of a metalworking plant that operates about 1,300 machine tools of all types indicates the advisability of using individual drives for its larger tools, such as planers and boring mills, as well as all other machines that require large amounts of power or are operated only part of the time. All other machines are driven in comparatively small groups from a lineshaft.

447

Better Belt, Half the Cost

Endless belts used on all compressor drives in one plant were expensive and had to be rebuilt periodically.

Development of a method of making rubber belts endless on the pulleys led to the use of one 22-in., 6-ply rubber belt on a 160-hp. compressor drive. This belt cost about half as much as the type heretofore used. No attention has been required in more than a year of operation.

448

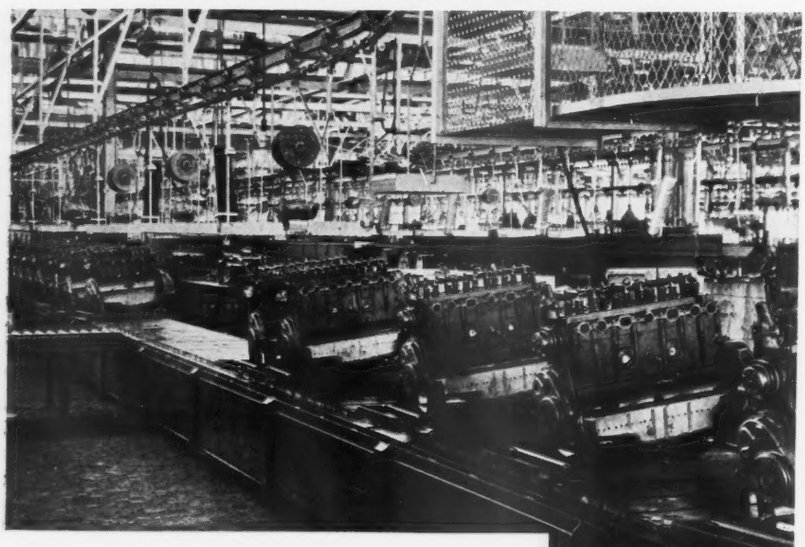
Cuts Power Costs $19,000

Installation of a centralized lubrication system on a blooming mill with a monthly output of 50,000 tons, resulted in power savings of more than $19,000 a year. This saving amounts to more than three times the total installed cost of the system.

In addition, life of the bearings has increased to six times its former value with hand lubrication, repair and maintenance costs have been reduced. And the capacity of the mill has been increased, due to the saving in power.

MECHANICAL HANDLING

is more than ever the most fertile field for cost savings that increase profits



MHS is an organization of 20 years' experience specializing in the coordination of plant layout, manufacturing processes and mechanical handling to effect greater production economies.

MECHANICAL HANDLING SYSTEMS Inc.

MANUFACTURING ENGINEERS

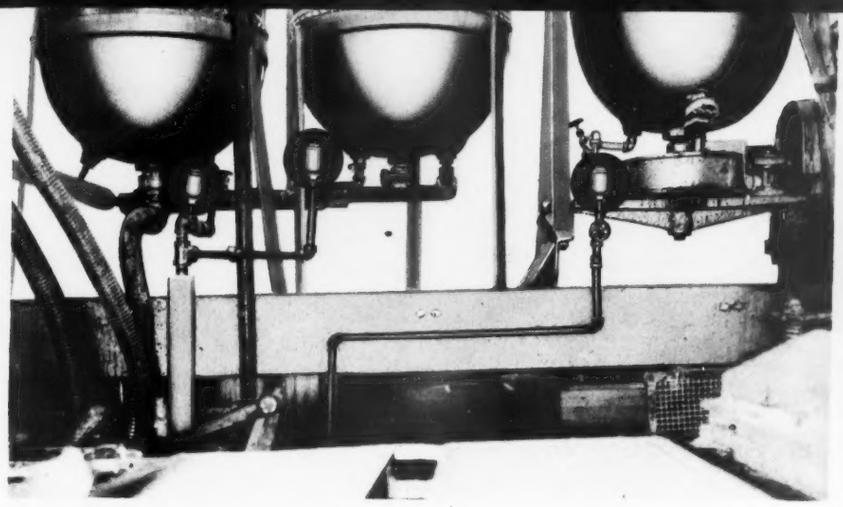
OFFICES IN PRINCIPAL CITIES 4600 NANCY AVE. Detroit, Michigan

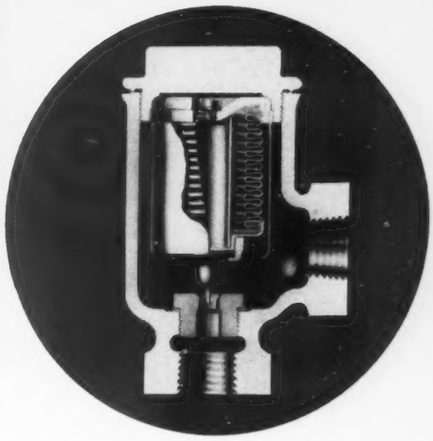
HEATING, VENTILATING, AND AIR CONDITIONING

(CONTINUED FROM PAGE 85)

great deal of door opening and closing in winter months. Cold blasts from the open doors were hard on workers. While they shivered, covered up, closed the doors, work was interrupted. (*Continued on page 140*)

3 LITTLE SARCO STEAM TRAPS





ARE LARGE ENOUGH for these big candy kettles

It's what's inside the trap that counts. These No. 9's, for instance, are actuated by the famous Sarco heavy wall thermostatic bellows with helical corrugations. The lift is powerful—the action is sensitive and positive from 0 lbs. pressure to 200 lbs.

No. 9 steam traps are also the most economical means for removing air and condensate from all kinds of steam equipment. Their low cost encourages individual trapping, a system that cuts production time and eliminates rejected material in process operations.

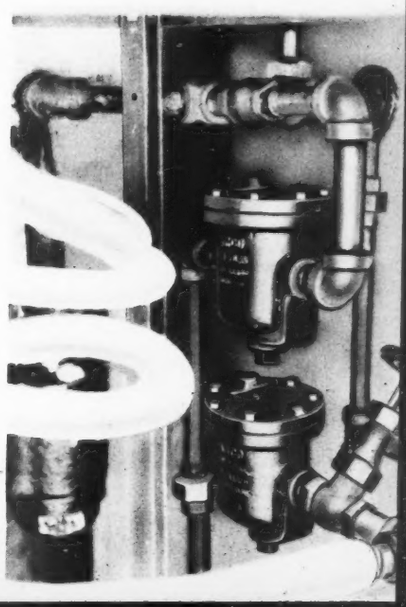
No. 9's are small, easy to install and can be used anywhere—indoors or out. They cannot freeze. Sizes ½" to 2". Ask for catalog No. I-48.

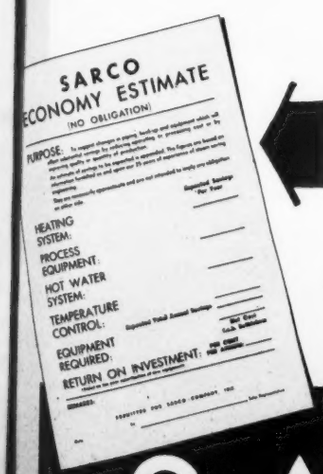
SARCO No. 9

Thermostatic Steam Trap with the famous Sarco thermostatic bellows.

SARCO INVERTED BUCKET TRAPS

on double platen press operated with super-heated steam.





GET A SARCO ECONOMY ESTIMATE NOW

One post card request, and the results of a quarter-century of experience in both high and low pressure steam trapping and control are at your service—without obligation. Find out what you can save and what it would cost.

SARCO

COMPLETE SYSTEMS FOR HEATING AND INDUSTRY

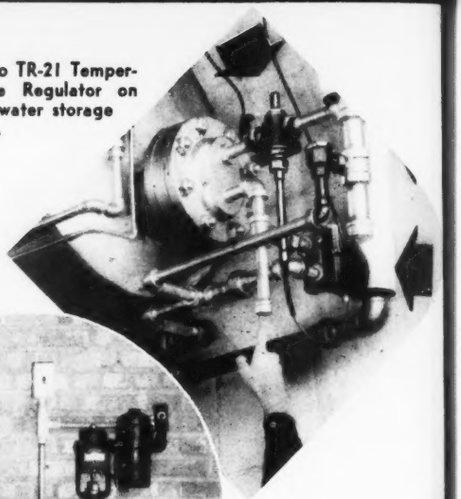
SARCO COMPANY, INC.

183 Madison Avenue, New York, N. Y.

SARCO CANADA LTD., FEDERAL BLDG., TORONTO, ONT.

TWO PRESSURES AND TWO TEMPERATURES . . *blended into one*

High up on the L. A. Dreyfus Co. plant at Staten Island—two tanks furnish water for exacting washing processes on the floors below. Mixed by a Sarco Blender, two incoming pressures and temperatures are blended into one constant factor. As both valves in the blender are double-ported and fully balanced, the operation is unaffected by changes in temperatures or pressures of the incoming supply.

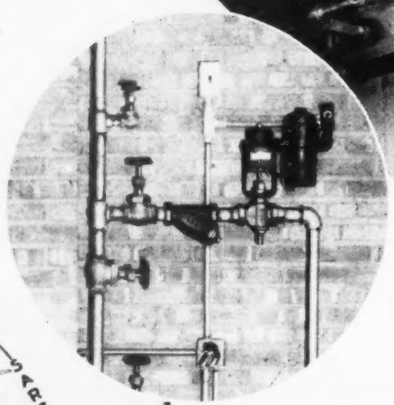


Sarco TR-21 Temperature Regulator on hot water storage tank.

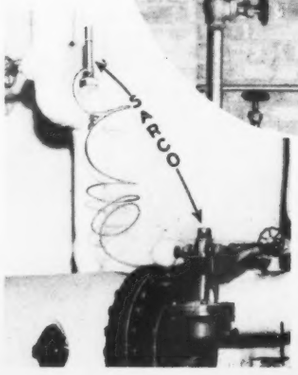
REMOVE ALL TEMPERATURE WORRIES WITH SARCO TEMPERATURE CONTROL

A difference of only a few degrees can result in many kinds of losses—lost heat, lost time, lost production and lost man power because of poor working conditions. Sarco Temperature Regulators remove guesswork and man-failures. They control temperatures of tanks, air conditioning and process equipment.

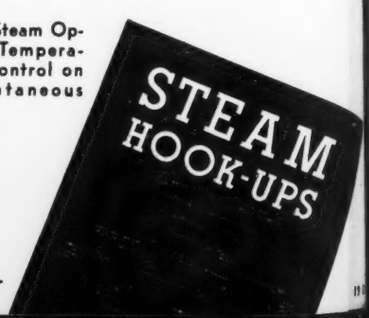
Made in a variety of types and sizes for settings from 0 to 400°F. Ask for Catalog No. I-52 for self-operated, I-150 and I-151 for electric temperature controls, 140 for blenders.



Sarco Electric Control on compressed air line in printing plant.



Sarco Steam Operated Temperature Control on instantaneous heater.



ASK FOR THIS DATA BOOK on your letterhead ►

SARCO

THERMOSTATIC, FLOAT AND BUCKET TRAPS, REGULATORS AND HEATING SPECIALTIES

SHIMMIES and SHAKES tell a *Short* story!

Our timid traveler, disturbed and disgusted by the seductive quivers of the grass-sashed tropical Jezebel, puts the situation behind him by beating a strategic retreat. Probably the best way out where vivacious vibration is concerned, but if the wiring in your hot spots shimmies and shakes you can't walk out on the problem—because the insulation is going to dry out, crack open, and create leakage and shorts . . . unless the circuits are wired with a heatproof wire such as Rockbestos.

In locations where you have heat and vibration install Rockbestos asbestos insulated wires and cables if you want to spare yourself a lot of trouble and make considerable savings in maintenance expense. An electrician in a drop-forge plant testified to this when he wrote: "Our rubber insulated power feeders took an awful beating. We replaced them with Rockbestos and have had no trouble since."

Rockbestos wires and cables are positively vibration-proof because they are absolutely heatproof. More than fifty constructions to select from. For samples write to Rockbestos Products Corporation, 902 Nicoll Street, New Haven, Conn.

Also refer to Electrical World Buyer's Reference Number of 1938.

OTHER ROCKBESTOS FEATURES

IT WILL NOT BLOOM

Rockbestos won't rot, bloom or swell under action of oil, grease or fumes.

IT HAS GREATER CARRYING CAPACITY

Rockbestos' greater carrying capacity saves conduit replacement, labor and money.

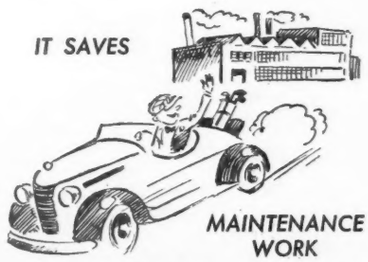
IT IS HEATPROOF

Rockbestos insulation, made of asbestos, does not deteriorate under heat. It's flameproof, too.

IT IS PERMANENT

Rockbestos is always "as good as new" because asbestos is naturally time-resistant.

IT SAVES



MAINTENANCE WORK

Rockbestos wired circuits eliminate frequent and expensive replacement.

ROCKBESTOS A.V.C.—*the wire with permanent insulation*

(CONTINUED FROM PAGE 136)

Unit heaters of the propeller fan type, blowing directly at the doors, now keep cold air from coming in, have made working conditions close to the doors more comfortable.

449

No More Wintry Blasts

A simple air lock helps to keep the shipping room warm in one large plant. Two adjacent 14-ft. roll-down doors permit egress of packed goods. A portion of the shipping room is separated by wooden tongue-and-groove partitions, the width of the two large doors and one bay deep. Counterbalanced garage-type doors in the partitions permit access to the inclosed space. When outside doors are open, inside ones are closed, and *vice versa*.

450

Picks Money Out of the Air

Use of ten electrostatic dust precipitators on its automatic glaze-spraying machines makes it possible for a pottery to recover 8,000 lb. of glaze in a 40-hour week. Value of the glaze is from 6c. to $2 a pound.

An incidental but important advantage was the release of 300 sq.ft. of space occupied by the settling chamber formerly used. It required 8 hours to clean that chamber; with the new units cleaning is done in 30 minutes.

451

$450 Saved in One Season

Heating fuel costs went down 25 per cent, and $450 was saved in one season by installing a new boiler and a stoker at Bell Overall Company, Greensboro, N. C. Steady, even heat throughout the plant bettered working conditions for employees.

452

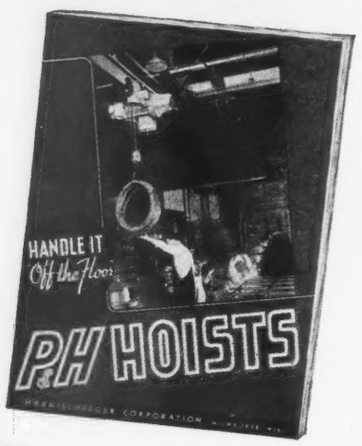
Doubles Rate of Production

Temperature and humidities went up and down in the plant of a grinding wheel manufacturer often necessitating rescreening of some materials. Air conditioning brought uniform temperature and humidity the year round, increased rate of processing during hot weather 100 to 200 per cent, depending on size of wheels.

FREE FOR YOU TO USE

THEY'LL SAVE YOU MONEY

You'll find in this bulletin, many new money-saving ideas selected from the thousands of P&H Hoist installations. It is not unusual for P&H Hoists to cut handling costs as much as 60%! Isn't it time to check up?



THIS MAKES IT EASY TO GET!

Your name and address on this coupon will bring you a copy of Bulletin H-5, "Handle It Off the Floor." It may show you how to save thousands of dollars. Why not send for it today?

HARNISCHFEGER CORPORATION,
4525 W. National Avenue, Milwaukee, Wisconsin.
Send along a copy of your Bulletin H-5.

Our handling job is.....
(Kind of material)
Firm Name .....
By..... Title.....
Address .....
City..... State.....

HARNISCHFEGER
CORPORATION
HOISTS • WELDING ELECTRODES • MOTORS P&H EXCAVATORS • ELECTRIC CRANES • ARC WELDERS

WINNERS OF THE FACTORY AWARDS

(CONTINUED FROM PAGE 98)

clamped into position, and the slotted ends of a hand lever on the truck are placed under the lugs projecting on either side of the band. The barrel is then raised from the floor with very little effort. The back wheel of the truck is on a swivel and the barrel is easily pushed to the desired location. The barrel always remains in a vertical position.

This truck will handle full or partially full open-top barrels. One man can easily and safely pick up a full container of the heaviest material. Back-straining over heavy loads is eliminated.—*R. C. Stark*, General Superintendent, Pratt & Lambert, Inc., Buffalo. ($5 Award)

453

13 Ways to Check Wastes

Few things contribute more to cut costs than an organized and permanent campaign against waste. We have a department waste committee which meets weekly to discuss savings. Here are the points of its program:

NOW

A MAJOR ADVANCE IN D-C INSTRUMENTS

The G-E Concentric-magnet Design

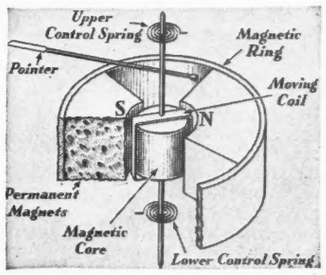
1. d'Arsonval Instrument
2. Magnetic Vane Instrument
3. Electrodynamic Instrument and NOW
4. Concentric-magnet instrument

IT'S NEW

In the past, most instruments were classified under three headings. But now, with General Electric's development of Alnico — an alloy of unusual magnetic strength — there's a new addition: the CONCENTRIC-MAGNET instrument for accurate d-c measurements. This marks a big step ahead in measurement technique.

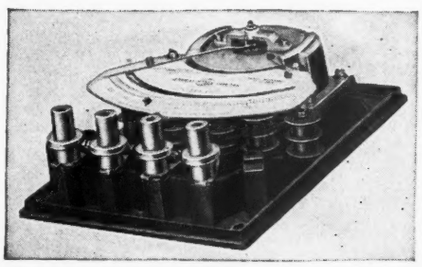
WHAT it is

Concentric-magnet construction consists of a soft-iron ring completely encircling two sector-shaped Alnico magnets or pole pieces — between which are a moving coil and a magnetic core.



This permits the design of a circuit which is not only self-shielded, but is also magnetically self-contained. Sensitive devices located near the instrument are substantially unaffected.

WHY you get better d-c measurements this way



WHY? Because only with G-E concentric-magnet construction can you get (1) an element that's self-shielded magnetically, with (2) an unusually high air-gap flux density. The first minimizes effects of stray magnetic fields — makes for accuracy under actual operating conditions. The second provides more torque and great dependability in all ratings. In short, you can now get a highly sensitive, quick-indicating d-c instrument.

HOW IT HELPS YOU

This new portable d-c instrument, Type DP-9, is General Electric's newest contribution to savings obtained from accurate measurement. It's a medium-sized unit — fits in your overcoat pocket. And it's an instrument with new capabilities for sure, sensitive d-c measurements.

Find out more about the DP-9 from your nearest G-E office. Or write General Electric Company, Schenectady, N. Y.

HEADQUARTERS FOR ELECTRICAL MEASUREMENT

GENERAL ELECTRIC

430-118

1. Employees are taught to be waste-minded. They are encouraged to report possible wastes, cost of wastes, and effect on jobs.

2. Work instructions to employees are carefully checked to make certain they are clear and understood.

3. Suggestions are exchanged between supervision and employees on waste elimination.

4. Various men are assigned to police wastes—one for light, water, power, and so on.

5. Employees are encouraged to ask questions when in doubt.

6. Only facts, not opinions, are considered when decisions are made.

7. Competent leadership in each group is required, strict discipline enforced. Written standard practice instructions showing what, how, and why must be followed.

8. Errors are reported immediately, reasons analyzed, remedies applied.

9. Signal bells, conveyors, and loud speakers are used to minimize walking and speed up production.

10. Measured time is applied whenever possible to every employee. This, we believe, is the only assurance of profitable man-hours.

11. Employees are trained on various operations so that they may be transferred on short notice to balance production and eliminate non-productive time. This also equalizes man-hours among the men, assuring better industrial relations.

12. Tools and materials are arranged to avoid excess motion.

13. Prizes are awarded for best ideas on waste elimination.—*W. G. Fremont*, Department Supervisor, The Standard Register Company, Dayton. ($5 Award)

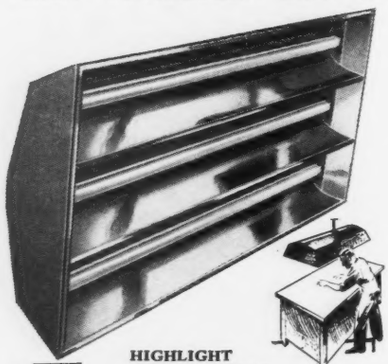
SOMETHING IMPORTANT
has been done about
"COLOR CORRECTIVE" LIGHTING

A NEW type of lamp . . . and a new type of Benjamin lighting unit especially designed for this lamp . . . now make possible a great improvement in the lighting of those localized operations requiring light with "color corrective" qualities.

With this new Benjamin unit "Daylight" lighting is improved four ways. *First*, never before has it been possible to produce at this low operating cost the quality of the "Daylight" illumination provided by the Benjamin "DAYLIGHT" FLUORESCENT LAMP DIFFUSER; *Second*, this improved "Daylight" lighting is produced without the usual absorption waste of the incandescent type lamp corrected for "Daylight" illumination; *Third*, the new fluorescent lamp has a much lower surface brightness (less glare) and *Fourth*, generates a minimum of radiant heat, hence units may be mounted low over the working plane and even in direct line of vision without discomfort to the worker.

THE OPERATING COST HAS BEEN SENSATIONALLY REDUCED! . . . . . .

THE EFFECTIVENESS HAS BEEN SENSATIONALLY INCREASED!



HIGHLIGHT SPECIFICATIONS.

Each unit is arranged for three 36-inch, 36-watt fluorescent lamps. Since fluorescent lamps are essentially mercury arc sources, auxiliaries are necessary for operation on standard lighting lines. Benjamin units have these auxiliaries built into the fixture. The reflector is of polished Alzak Aluminum, the ideal material for effective utilization of the fluorescent type lamp, because of its high lighting efficiency and superiority in light control. There is an individual trough for each lamp. The units are available in two sizes.

How effectively the new Benjamin "DAYLIGHT" FLUORESCENT LAMP DIFFUSER UNIT reduces operation cost is evidenced by the fact that the new fluorescent unit drawing but 105 watts with auxiliaries, provides more lumens of light than does a 1000 watt incandescent lamp, corrected for "Daylight" illumination (6500° Kelvin color temperature rating).

This new Benjamin unit is designed for lighting of localized operations. For such requirements, it surpasses anything previously offered. For complete details, see your local electrical contractor or address the Benjamin Electric Mfg. Co., Des Plaines, Illinois.

The NEW BENJAMIN "Daylight" FLUORESCENT LAMP DIFFUSER UNIT

Distributed Exclusively Through Electrical Wholesalers.

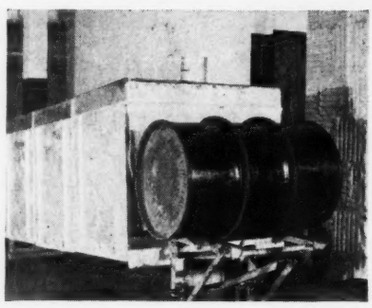
454

Drier Saves Steam, Space And Handling

For a number of years, we have been using an open steam coil for drying out returnable drums that have to be cleaned and sized after every trip.

We recently made an inclosed drier which provides increased drying capacity in less floor space, uses about one-quarter the amount of steam, confines the heat, and saves considerable labor in the handling of drums.

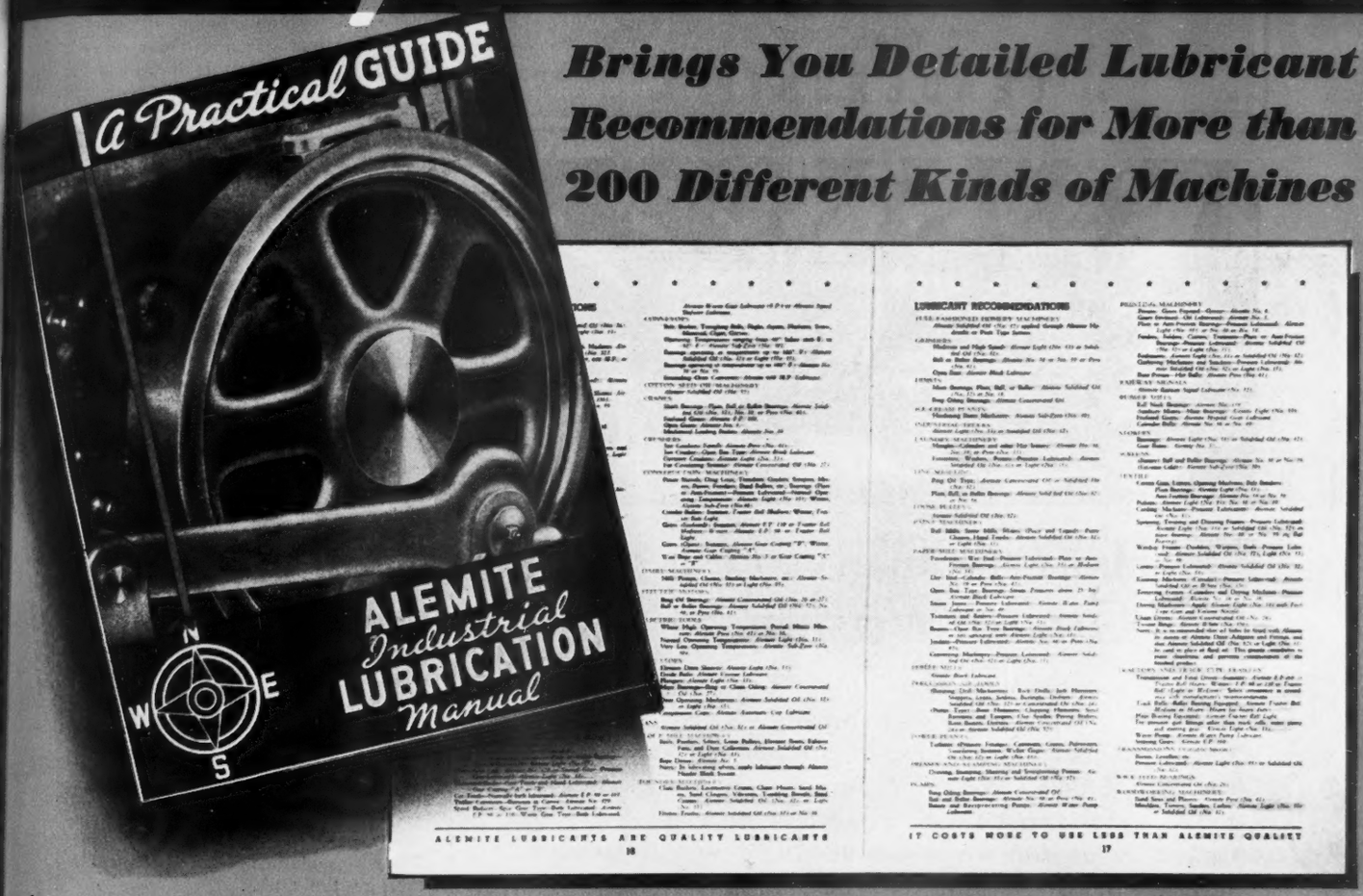
This drier is constructed of two 6-in. channel iron beams 21 ft. long, with an angle-iron frame to which the insulating boards are screwed. Half-inch insulating board is used on the side panels, ¾-in. board for the



top panels. All panels are removable. A canvas curtain is used at each end of the drier, which is set up on a slight incline so that the drums will move forward by gravity. Eight lengths of 1½-in. pipe, with steam pressure at 75 lb., are assembled in the bottom of the drier, furnishing the heat.

The drier holds 10 drums and discharges one drum thoroughly dry every 6 min. There is but one foot lever to operate at the loading end. This lever controls two sets of stops, one set placed at the discharge end and the other set about 30 in. in from the discharge end. When the foot lever is pressed down, it releases the end stops, allowing the end drum to roll out, at the same time lifting the second set of stops

Took Years to Compile . . .
But it's *Yours* for the Asking!



Brings You Detailed Lubricant Recommendations for More than 200 Different Kinds of Machines

ALEMITE, to many industrial leaders, means more than dependable, positive modern lubrication equipment. It means the *finest* in specialized industrial lubricants!

Let this new Manual bring you *the most up-to-date information on a vitally important subject!* Profit by the years of research and experience which have gone into its preparation. Learn, perhaps, how you can insure better machine performance, avoid bearing failures, and reduce maintenance costs by using the right Alemite Specialized Lubricants!

Mail the coupon today for your copy of this valuable new Manual! It's yours for the asking!

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Please send my copy of your new Alemite Industrial Lubrication Manual.

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FOR MANY HANDS . . . Use Group Washing Fixtures

● Eliminate delays in the washroom with group wash fixtures which accommodate 10 at a time . . . Bradley Washfountains are providing this modern method in foremost plants today, washing over four million hands daily.

Bradleys save time, cut water costs 70%, cut piping installations 90%—and space 25%. You can install Washfountains in new or existing buildings and pay for them out of savings . . . Let us mail our new brochure on group washing fixtures and economical washroom layouts. BRADLEY WASHFOUNTAIN CO., 2215 W. Michigan St., Milwaukee, Wis.

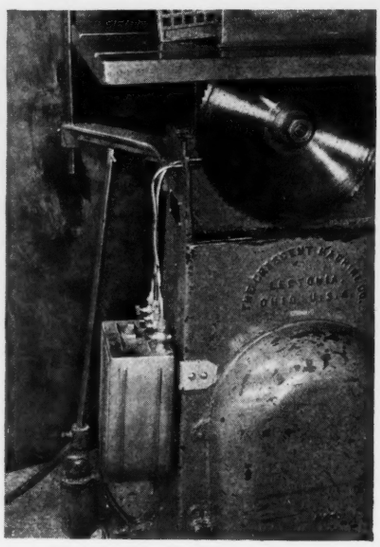
BRADLEY WASHFOUNTAINS

which prevents the next drum from following. When the foot lever is released, the stops spring back to a locked position, and the inner stops are released, allowing the remaining drums to roll forward in the drier.—*W. H. Jones*, Master Mechanic, Pratt & Lambert, Inc., Buffalo. ($5 Award)

455

Oiler Prolongs Saw's Life

The photograph shows an oiler used on motor-driven circular saws throughout our plant. It it attached to the machine and consists of a welded metal container, approximately 6 in. long, 3 in. wide and 10 in. deep. There is an oil intake at the top and an air connection at the bottom. Extending from the top of the container are two oil lines, so placed as to throw a continuous spray of oil on each side of the cutting blade. This spray is obtained from forcing air through the tank.



Production has increased appreciably since the installation of this oiler on our machines. In addition we have found that the cutting life of the saw itself has been prolonged from two to four months.—*L. N. Davis*, Plant Engineer, Douglas Aircraft Company, Inc., Santa Monica, Calif. ($5 Award)

456

No-Cost Batch Control

The batch control method that adequately governs an operation at no cost is rare indeed, but we hit on one in our plant.

We have an operation in which each of several kettles in a battery is loaded and processed for 20 min., at which time two more ingredients are added, and the process is continued for 5 min. more. The batch is

SIMPLE

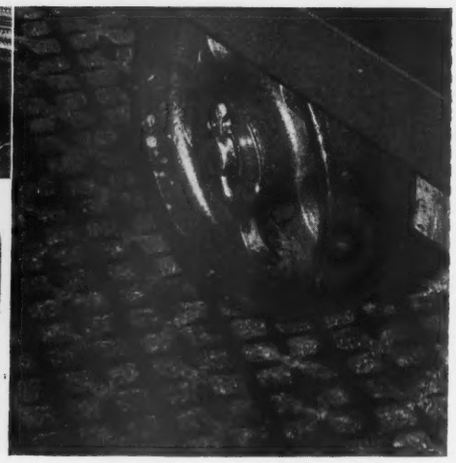
Thrust capacity is a part of the simple basic design of the Shafer Bearing. The CONCAVE rollers and curved races provide for radial, thrust, or combined radial-thrust loads in any proportion—without the need for additional features. The curved roller design also provides integral self-alignment, and a simple means for adjustment of the bearing. Only Shafer includes all these features in one bearing.

Available in a full range of sizes: Pillow Blocks Flange Units • Take-up Units • Cartridge Units Hanger Boxes • Flange-Cartridge Units • Duplex Units • Conveyor Rolls • Radial-thrust Roller Bearings

Write for Catalog 14 with complete information

SHAFER BEARING CORPORATION
35 EAST WACKER DRIVE • CHICAGO, ILLINOIS

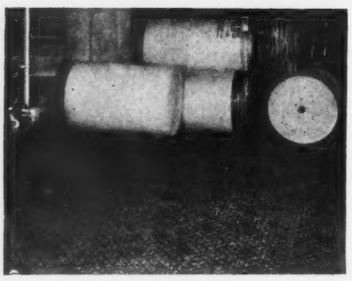
SELF-ALIGNING ROLLER BEARINGS



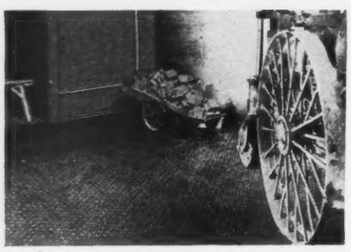
SNEAD ARMOR GRIDS

Banish 'Tramp' Floors Forever

Between now and 1964, how much will you spend to keep your heavy traffic floors in perfect condition? NOT ONE CENT, if you armor them with Snead Grids. Past performance proves it. After a quarter century of gruelling punishment of every kind, not a single installation of Snead Armor Grids has ever had to be repaired or replaced. Do you know of any other floor armor with such a record?



IN PAPER MILLS—Heavily loaded dollies roll easily on Snead Armored Floors. Grids prevent cracking, rutting, dusting or spalling of concrete.



IN FOUNDRIES—Dropped castings, heavy traffic, temperature changes, moisture, etc., provide ample evidence of the durability of floors armored with Snead Grids.

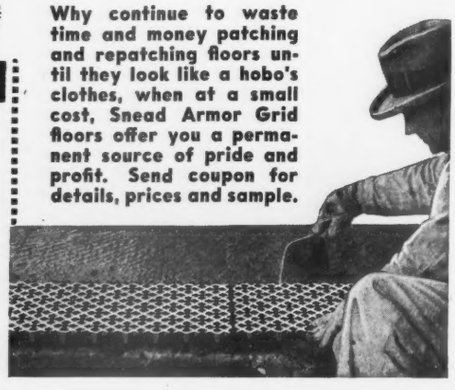
Permanent—Snead Armor Grids absorb severe shocks, carry heavy rolling and sliding traffic quietly, and resist the corroding action of moisture, chemicals and brine. They permanently protect aisles, elevator entrances, driveways, ramps, platforms, cold storage rooms and other heavy traffic areas which otherwise would require frequent repair and replacement.

Cast of fine grey iron, their granular side walls bond inseparably with the concrete or mastic in which they are imbedded, forming a single homogeneous mass, permanently secure against seepage, rusting or loosening. No surface treatments are ever required. The floor actually improves with use.

Non-skid Economical—The pleasing symmetrical pattern of Snead Armor Grids provides a skid-proof, yet smooth-running surface in every direction. They are made in sections 2'0"x1'0", light, medium and heavy weight. They displace 21% of the grout by volume and cover 41% of the total surface area with armor, saving considerable filler material over other types of armor.

Easy to Install—Your own men quickly install Snead Grids right over your old worn floors. No expensive assembling, anchoring or fastening devices are required.

Why continue to waste time and money patching and repatching floors until they look like a hobo's clothes, when at a small cost, Snead Armor Grid floors offer you a permanent source of pride and profit. Send coupon for details, prices and sample.



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142 Pine Street, Jersey City, N. J.

☐ Send details of Snead Armor Grids.

☐ Send Snead Armor Grid sample.

NAME .....

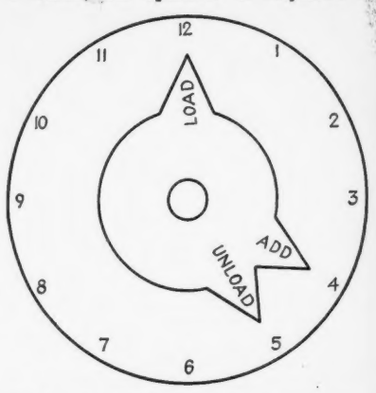
ADDRESS .....

CITY..... STATE.....

then unloaded over a 5-min. period, completing a 30-min. cycle. A large clock was mounted on the wall in plain sight of all the operators to enable them to time the batches correctly. We had excellent supervision and conscientious operators, but the human element still prevailed.

A hurry-up call was sent out for a low-cost remedy, the low-cost qualification eliminating the possibility of automatic alarms or batching equipment for each kettle.

The problem was neatly solved. Mounted on a vertical board by each kettle is a 10-in. dummy clock with a freely rotating dial. As he loads a batch, the operator is required to



set the "load" hand at the time shown by the minute hand of the wall clock, and perform the other operations when the clock minute hand corresponds to the other hands on the dummy clock.

This is a no-cost control that can be utilized on any short-cycle job requiring several operations at fixed intervals of time, and can be understood by any employee, even if he cannot tell time.—*H. R. Conklin*, Assistant to General Manager, Franklin Baker Division, General Foods Corporation, Hoboken. ($5 Award)

457

Progressive Rinsing Saves Manual Handling

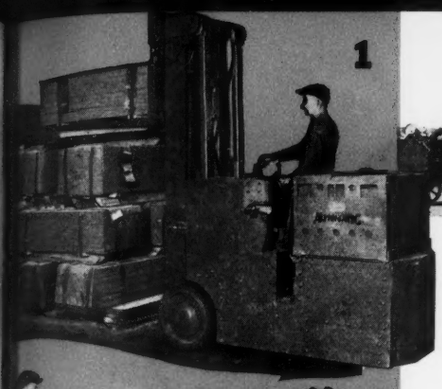
After our small parts are plated, they have to be taken through five rinses. This was formerly done by hand, using small baskets and requiring considerable time and labor.

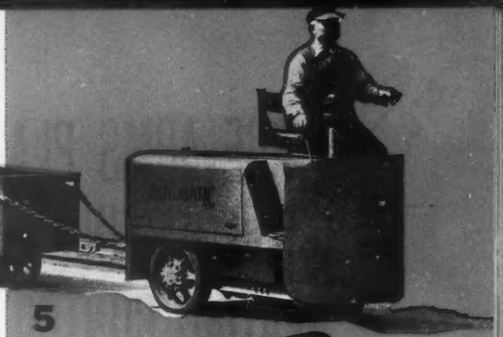
A method has now been installed whereby the operator dumps the parts from the plating barrel into a perforated bottom hopper in the first tank and pushes a start button and then goes about his other work.

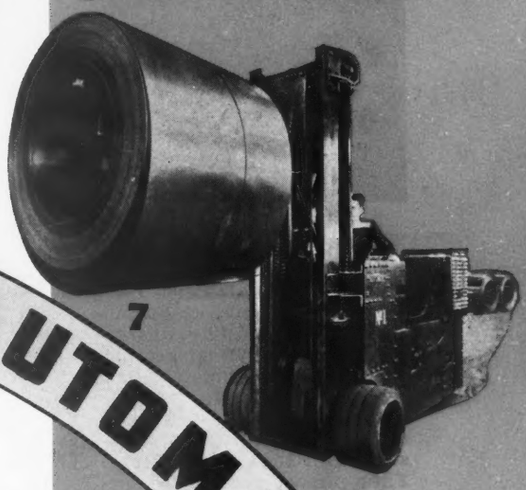
Mounted in the trusses over each tank are a motor and speed reducer, with an arm about 12 in. long on the speed reducer shaft in the form of a crank. From this a rod runs down to a bar which is connected on each side

115 QUICK PRACTICAL WAYS TO *Aid* LABOR TO *Cut* COSTS TO *Save* TIME TO *Increase* PROFITS

USE MODERN TRADE AUTOMATIC MARK







You can now choose the *exact* model essential for your *individual* requirements from the *115* Standard "AUTOMATIC" Models. These are built in capacities from one to thirty tons to meet requirements of *Every Industry*.

Each model is designed to fit the job constructionally—mechanically—electrically—with the latest engineering features. For ultimate safety to men—Greatest efficiency in operation—Economical and dependable service.

The models illustrated are typical of the complete line of "AUTOMATIC" Industrial Trucks—Tractors—Cranes. No doubt *YOU* have a job right NOW!!! which one of these standard "AUTOMATIC" Models can do for you. If not a standard model, perhaps a special or modified standard "AUTOMATIC" will.

So write today or better still phone the "AUTOMATIC" Sales Engineer nearest you. Discuss your problems freely without obligation.

ELECTRIC MATERIAL HANDLING EQUIPMENT

USE THE COUPON

AUTOMATIC TRANSPORTATION COMPANY
DIV. OF THE YALE & TOWNE MFG. CO.
39 W. 87th St. CHICAGO, ILL.

Gentlemen: Please send details on trucks referred to by
No._____
or send the Automatic Catalog.

Name_____ Position_____
Address_____
Company_____
City_____ State_____

WHEN YOU BUY TRUCKS · · *Buy* "AUTOMATIC"

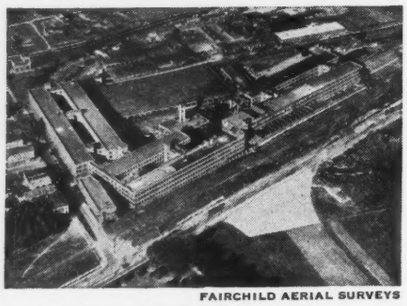
SAVAGE ARMS PLANT EMPLOYS UNIQUE HEATING CONTROL

Buildings Heated Using Manifold Pipe Coils Modernized with Webster Moderator System

Heating Results Substantially Equal to Those Obtained with Cast Iron Radiation

FUEL SAVING IS APPRECIABLE

Utica, N. Y.—In the plant of the world-famous Savage Arms Corp., the heating of a large and varied group of buildings is controlled from one central point by a Webster Moderator System.



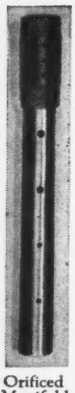
FAIRCHILD AERIAL SURVEYS

Savage Arms Plant, Utica, N. Y.

The application of this modern heating control to an installation using orificed manifold pipe coils, while unusual, has resulted in even temperatures with an appreciable reduction in heating costs.

When the heating of the Savage Arms Corp. was modernized in 1935, patented Webster Manifold Coil Orifice Fittings made possible the successful balancing of steam distribution and application of Webster Central Controls.

Separate heating schedules for 12 heating zones are provided by a 12-zone Webster Moderator System. The supply of steam to each zone is controlled from a central station. An Outdoor Thermostat adjusts the basic rate of steam delivery in accordance with changes in outdoor weather conditions.



Orificed Manifold Pipe Coil

These before-and-after facts point the way to maximum comfort and economy in heating new buildings as well as in modernization of existing installations. Consult your architect, engineer or heating contractor. Or address

1888 WARREN WEBSTER & CO., CAMDEN, N. J. 1938

Pioneers of Modern Steam Heating

50 YEARS OF HEATING PROGRESS

Representatives in 60 principal U. S. Cities

of the hopper at about the middle point. One complete revolution of the speed-reducer shaft raises the hopper to a dumping position allowing the pieces to dump out of this hopper at the hinged end into the next hopper, and then returns the hopper into the tank to a loading position where it stops. On each speed-reducer shaft there is a cam that starts the following motor, so that the work is carried through the entire set of tanks and dumped into pans as it comes out of the last tank.

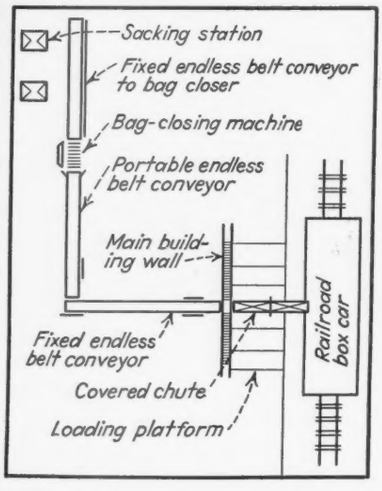
With this progressive rinsing scheme it is possible to eliminate from one to two operators, depending on the amount of production.—*L. B. Thompson*, General Foreman, Maintenance Department, Bendix Products Division, Bendix Aviation Corporation, South Bend, Ind. ($5 Award)

458

Ups Bags per Hour 30%

By using an endless belt conveyor and a hinged chute we have been able to increase our bags loaded per man-hour just 30 per cent.

The bulk product is automatically weighed into 100-lb. bags and conveyed to the bag-closing machine. Here it was formerly our custom to load five or six bags on a hand truck and truck them into the car. This method took several men and trucks to keep up with production.



Now the man operating the bag-closing machine merely tips the bags from the end of his machine on to the portable belt conveyor, which takes them away and elevates them enough to drop them on the lower end of the fixed belt conveyor. The latter then takes the bags up about 8 ft. above the floor level and to an opening in the building wall, where the bags drop through a covered chute to a loading table inside the box car.

One man loads the bags in the car

CUT THE COST OF METAL CUTTING

Save many ways with STAR hack saw blades. They cut fast, stay sharp long, keep blade breakage down. The new metal boxes add convenience, protect blades, speed blade selection and identification.

Use STAR "Moly" and Tungsten hand and power hack saw blades to cut costs.

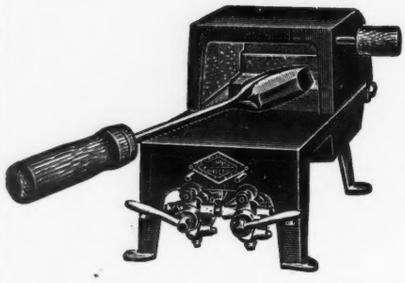
CLEMSON BROS., INC.

MIDDLETOWN, N. Y.

STAR HACK SAW BLADES

HAND AND POWER—TUNGSTEN AND "MOLY"

JOHNSON No. 101 Bench Furnace is Powerful, Dependable, Economical



You can heat soldering coppers up to 12 pounds per pair, and do superior heat-treating of carbon steel tools, gears or other metal parts up to furnace capacity. No muffle is required, because no blower or forced-air blast is necessary. Furnished with the furnace are a Work Rest Block and Baffle Plate to partially close front of furnace. The #101 has 2 Patented JOHNSON Direct Jet Bunsen burners with valves and pilot lights. Write for complete free catalog today.

JOHNSON GAS APPLIANCE CO. Cedar Rapids IOWA

COOL AS A DOG'S NOSE BOSS. IT'S THAT ONE-PIECE COPPER THAT DOES IT
YOU SAID IT JOE. NOTHING BUT WESTINGHOUSE FOR ME FROM NOW ON AND THEY'VE SURE LICKED BEADED CONTACTS WITH THOSE DIAMOND POINTED JAWS, TOO

SIMPLICITY IN SAFETY SWITCH DESIGN MEANS LESS HEATING

One-piece copper parts in Westinghouse Safety Switches assure cool operation at all times — there can be no heating from loose connections.

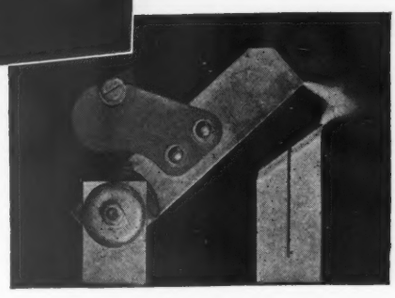
And years of trouble-free service are assured by these added Westinghouse features: Diamond pointed jaws and extended blades confine beading to points outside the contact areas . . . the "De-ion" feature on all Westinghouse 575 and 600-volt switches quenches destructive arcs almost instantly.

. . .

All commercial types and ratings. Call your local:

Electrical Wholesaler
Motor Dealer
Industrial Agent
Electrical Contractor

The exclusive Westinghouse diamond pointed jaw confines the bead to sections outside the contact area, sections which do not normally carry current.



WESTINGHOUSE ELECTRIC & MANUFACTURING CO., EAST PITTSBURGH, PA.

J-20518

Westinghouse *Safety Switches*

MOTORS • CONTROL • CIRCUIT BREAKERS • SAFETY SWITCHES • PUSH BUTTONS

MEET HEATING NEEDS IN U. S. PRINTING & LITHOGRAPHING CO.

Owners of Large Baltimore Plant Use Webster Moderator System To Insure Balanced Heating

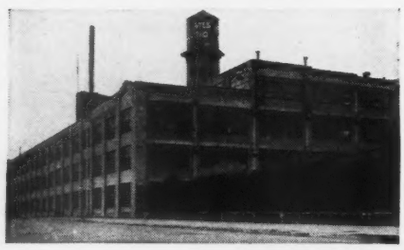
Coal Savings $1125 Yearly Average

Proper Temperatures Maintained in All Sections of Building Regardless of Weather

SYSTEM IS SELF-LIQUIDATING

Baltimore, Md. — Maintenance of the varied temperatures required in the large plant of the U. S. Printing & Lithographing Co. has been accomplished since 1935 with a Webster Moderator System of Steam Heating.

Keeping the press room at 75 degrees, office sections at 72 degrees and the remainder of the building at 65 degrees, regardless of outdoor weather conditions, a 4-zone Webster Central Control has met a difficult assignment well.



U. S. Printing & Lithographing Co.
Baltimore, Md.
East Wing—above West Wing—below

In addition to providing balanced heating service, the Webster Moderator System has allowed the U. S. Printing & Lithographing Co. to reduce the cost of heating an average of $1,125.00 per season. The cost of heating modernization is being recovered out of coal savings.

There is a total of 24,893 sq. ft. of installed direct radiation.

With the Webster Moderator System, an Outdoor Thermostat automatically adjusts the basic rate of steam delivery in accordance with weather conditions.

These before-and-after facts point the way to maximum comfort and economy in heating new buildings as well as in modernization of existing installations. Consult your architect, engineer or heating contractor. Or address

1888 WARREN WEBSTER & CO., CAMDEN, N. J. 1938
Pioneers of Modern Steam Heating
50 YEARS OF HEATING PROGRESS

Representatives in 60 principal U. S. Cities

from this table. The chute is hinged at approximately its middle so that the lower half can be pulled up out of the cars when not in use. A sliding gate in the wall opening is closed and locked when the conveyors are not operating.—*Fred L. Hull*, Great Western Sugar Company, Loveland, Colo. ($5 Award)

459
Loading Time Down 62½%

Our indirect labor costs for truck loading were high. We solved the problem by purchasing a 30-ft. portable conveyor. This conveyor is pushed inside the truck trailers. One man stands in the truck on the receiving end. Another man stands on the feeding end of the conveyor. Third man brings the shipments to the conveyor.

It used to take three men two hours to load a trailer load. Now the same crew can do it in 45 minutes.—*Stanley Bykowski*, Foreman, Empire Central Box Corp., Clifton, N. J. ($5 Award)

460
Competition Ups Output

We have 93 people working in our plant, all paid by the hour. With hourly rates it is hard to get top production, because in the rates themselves there is no incentive to high output.

To awaken the sprit of competition I keep a record of what each of our two shifts does each day, and post the figures. I have also put back in effect bonuses paid on the basis of the day's output, with much success.

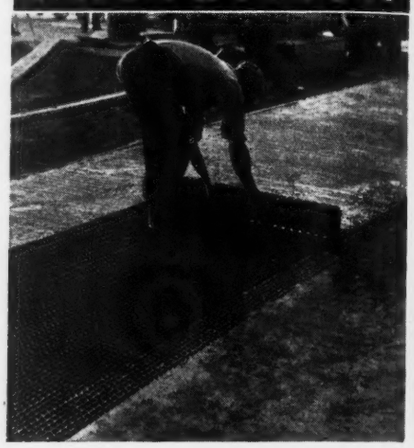
Since everyone was beginning to say our production was as fast as it possibly could be, I then began to figure some way of getting the employees to want to work faster. I decided to divide each shift into five crews, making a total of ten crews. Each day the crew that packs the most coffee gets some kind of inexpensive prize.

This idea has increased production 4,000 lb. a day. Additional cost is not over $1 per day. Since actual cost of packing 4,000 lb. of coffee is $12.80, we are actually saving $11.80 each day.—*E. C. Shackelford*, Plant Superintendent, Duncan Coffee Co., Houston, Texas. ($5 Award)

461
Eliminates Three Handlings

Much of our product is shipped "inter-plant" on trailer trucks. Under the old method all finished goods required three handlings between finishing and final loading. To save that labor we built several all-welded

FLOOR PROTECTION



EASILY INSTALLED

For new buildings as well as for the improvement or repair of present floors, ACME FLOORSTEEL is easily and economically installed. It is imbedded (flush with the top of the floor) in concrete, asphalt or other suitable floor surfacing material. The small mesh in combination with light sections of specially rolled strip steel provides floors that remain smooth and even during the life of the building.

ACME FLOORSTEEL is designed to take the brunt of rolling loads. Cracks, holes and ruts cannot develop. FLOORSTEEL is shipped in standard one-piece rolls 47½" or 60" wide and 25 ft. long. Special sizes may be obtained at no extra cost.

A SAMPLE SECTION and complete information will be forwarded for your inspection —there is no obligation. Mail the coupon today.

ACME STEEL COMPANY

General Offices: 2831 Archer Avenue, Chicago, Ill.
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☐ Send me the folder giving complete information about ACME FLOORSTEEL

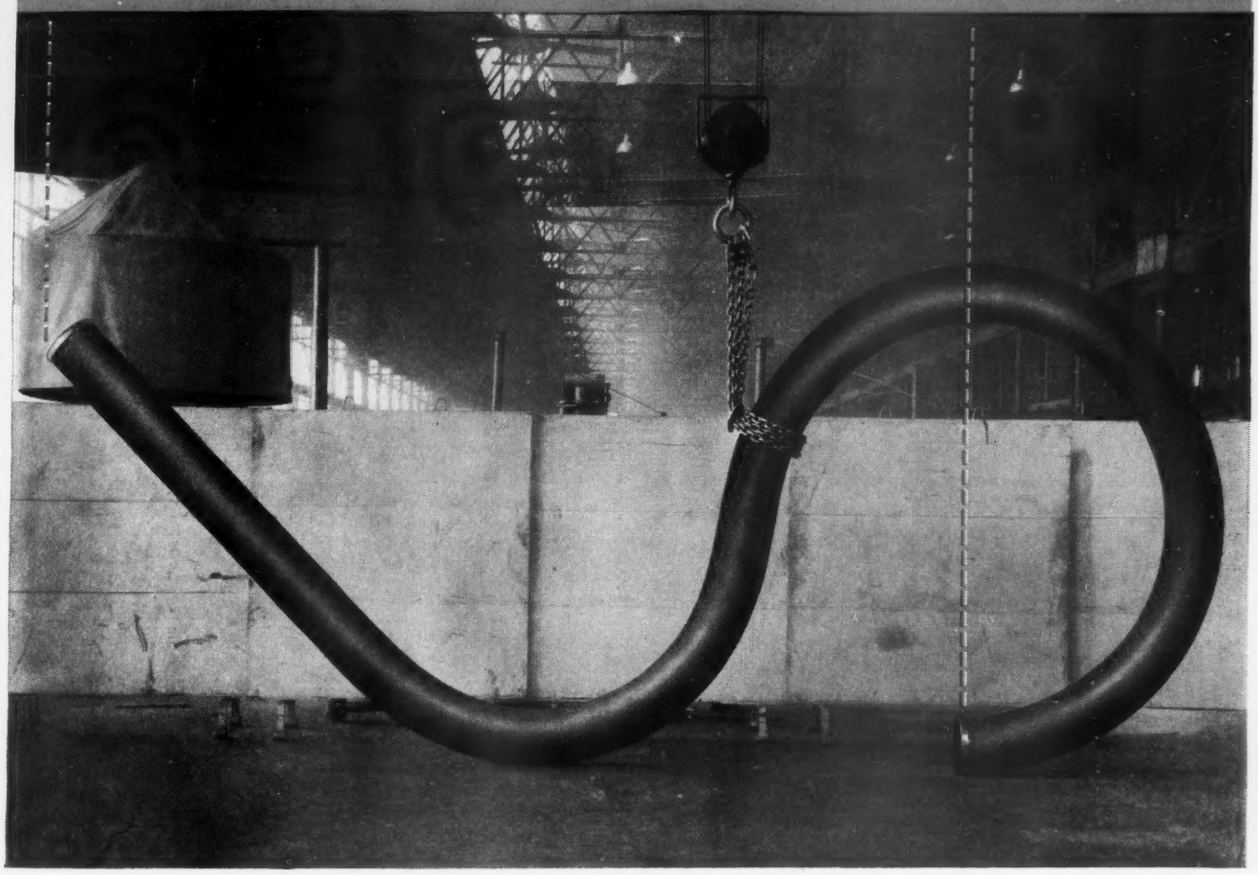
☐ Send me a free sample section of ACME FLOORSTEEL

Name .....

Address .....

City..... *State*.....

GRINNELL PREFABRICATION *Means* ACCURACY!



"Take a thirty-foot piece of twelve and three-quarter inch diameter seamless pipe of a weight and strength suitable for high pressure and high temperature. Bend it smoothly into the section of an expansion bend shown above. Make it fit specifications to allowable error of ⅛ *inch.*" . . . ¶ Those, in simple language, were the specifications for the Grinnell-prefabricated unit shown above — an important link in a public utility high-pressure steam plant. . . . ¶ That it fitted perfectly, without adding strains in installation, and that its stresses under high temperature and pressure were carefully provided for in its design, is another tribute to the judgment of engineers who say, "Give the plans to Grinnell!" Grinnell Co., Inc., Executive Offices, Providence, R. I. Branch offices in principal cities.

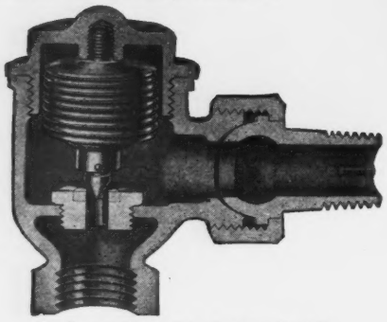
PREFABRICATION BY GRINNELL

WHENEVER PIPING IS INVOLVED

SAVE STEAM

with Webster Trap Attachments

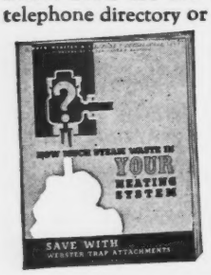
Worn-out or obsolete radiator traps waste heating dollars by allowing uncondensed steam to escape into return piping. The loss of steam from one radiator may be trivial but when multiplied by a number of radiators it becomes worth saving. Webster Trap Attachments, inserted in old trap bodies without disturbing piping, check this source of heat loss and often pay for themselves out of the savings effected.



Radiator Trap Modernized with Webster Sylphon Attachment

With Webster Trap Attachments, heating dollars work "full-time" in the radiators. The sensitive thermostatic element of Webster Trap Attachments retains steam in the radiators until it is condensed. There is continuous, free and thorough discharge of condensate and air. No air-bound or water-logged radiators.

A Webster Representative is ready to help you determine what heating troubles need correction and how steam savings can be made. Look for his name in your local telephone directory or write us.



A new booklet "How Much Steam Waste in your Heating System" is ready for your asking.

By the makers of
Webster
Systems of Steam Heating

1888 WARREN WEBSTER & CO., CAMDEN, N. J. 1938

Pioneers of Modern Steam Heating

50 YEARS OF HEATING PROGRESS

Consult nearest Webster Representative

ALBANY	DAYTON	MILWAUKEE	SAGINAW
ATLANTA	DENVER	MINNEAPOLIS	ST. LOUIS
ATLANTIC CITY	DES MOINES	NEW HAVEN	SALT LAKE CITY
BALTIMORE	DETROIT	NEW ORLEANS	SAN ANTONIO
BIRMINGHAM	EASTON	NEW YORK	SAN FRANCISCO
BOSTON	EL PASO	OMAHA	SEATTLE
BUFFALO	GRAND RAPIDS	ORLANDO	SPOKANE
BUTTE	GREAT FALLS	PEORIA	SYRACUSE
CAMDEN	HARRISBURG	PHILADELPHIA	TOLEDO
CHARLOTTE	HOUSTON	PITTSBURGH	TULSA
CHATTANOOGA	INDIANAPOLIS	PORTLAND, ORE.	WASHINGTON
CHICAGO	JOHNSTOWN	RALEIGH	WHEELING
CINCINNATI	KANSAS CITY	RICHMOND	WICHITA
CLEVELAND	LOS ANGELES	ROANOKE	WILKES-BARRE
COLUMBUS	LOUISVILLE	ROCHESTER	YAKIMA
DALLAS	MEMPHIS	ROCK ISLAND	YORK

IN CANADA DARLING BROS. LTD., MONTREAL

racks mounted on large casters. Each rack just fits the trailer body. On one side the rails which are of 1-in. pipe, rest in bracket supports, and are removable for easy loading and unloading.

An empty rack is placed at the finishing point in the process, is loaded as the product comes from the machine, is stored, and later loaded on the trailer. Three racks

make up a load equal to the full capacity of the trailer. On the other end of the trip these racks are similarly unloaded, stored, and delivered to the point of consumption. Thus no manual handling is necessary.

In addition to the savings in labor, the idle loading time for the trailer trucks is reduced more than 50 per cent.—*R. H. McLeod*, Superintendent, Reclaiming Department, Raybestos-Manhattan, Inc., Passaic, N. J. ($5 Award)

462

Magnet Makes Chip Removal Simple and Safe

In our plant 50 per cent of the castings require machining a blind bore in a vertical position. Removal of the chips that fall to the bottom has always been a difficult and dangerous operation. Previously the operator had to remove chips with his hands or hooks, resulting in burns and cuts. Blowing the chips out with an air hose was attempted, but this endangered the operators' eyes, besides blowing the particles into the moving parts of the machine.

Two years we started to use electro magnets to remove chips. Seven magnets have been in use 16 hours a day (two shifts).

All the operator has to do to remove the chips is to reach over to the side of the machine, grasp the magnet by its handle, and place it into the bore. He then presses the trigger switch on the inside of the

CUSTOM BUILT

FOR—
Extra Safety
Longer Life
Lower
Ladder Costs

Dayton Safety Ladders are not turned out from a volume production line. Each Dayton Ladder is custom built to give you the utmost in ladder safety and durability.

Daytons are made of durable airplane spruce, in sizes 3 to 16 feet. Stand firmly. Straight back permits close work. They cut your ladder costs because they last longer.

Write Dept. FMM-11 for details

THE DAYTON SAFETY LADDER CO.
121-123 WEST 3rd ST., CINCINNATI, O.

DAYTON
Safety Ladder
(Patented)

The ORIGINAL Safety Ladder

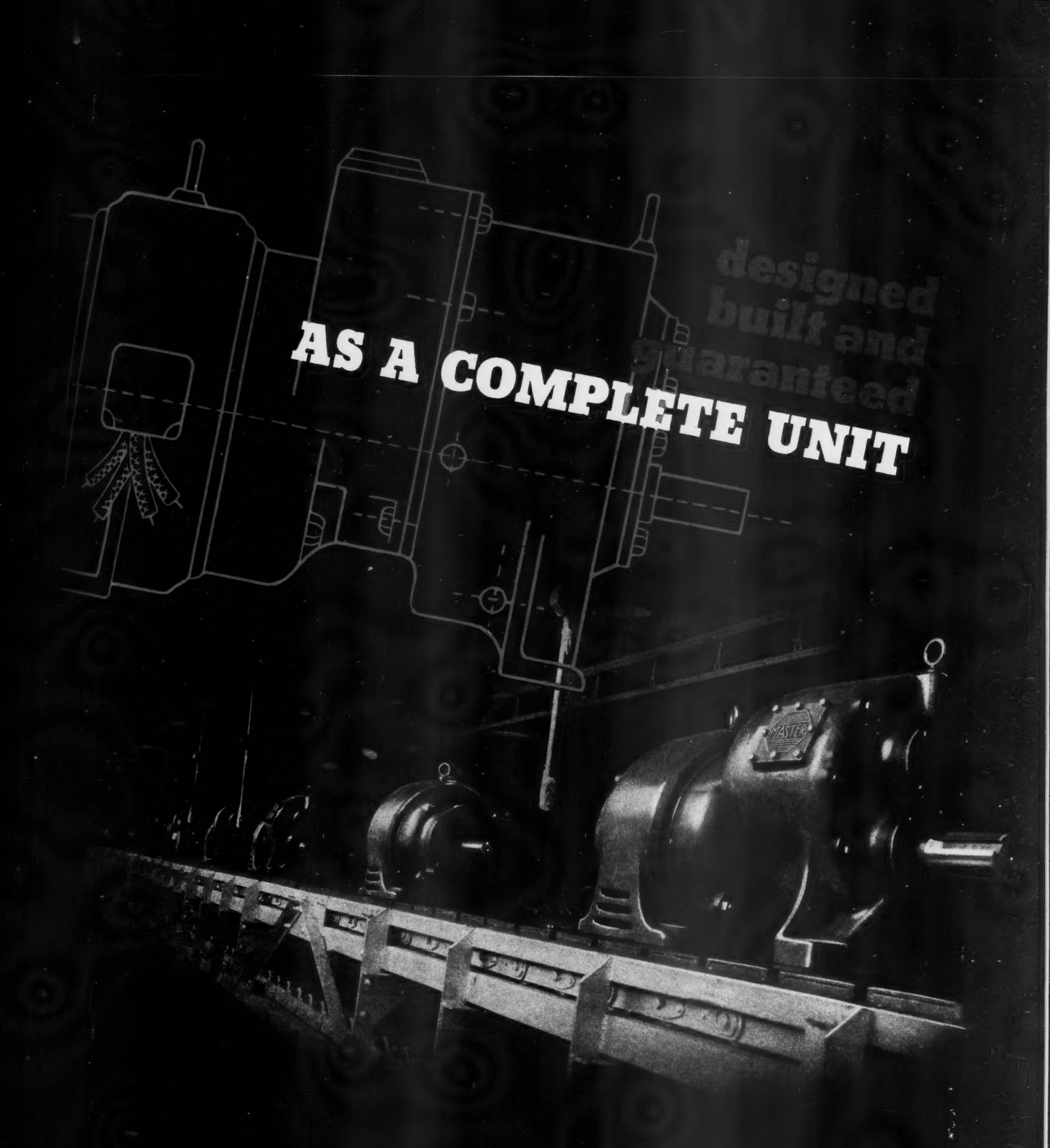
•Send today for our new catalog No. 5 showing a complete line of accident prevention equipment.

For Better Service—
INSTALL **TRICO**
REG. U.S. PAT. OFF.

RENEWABLE FUSES
With the famous *powder-packed* element
KANTARK "ONE-TIME" FUSES
With genuine fibre tubes (not paper)
COLORTOP PLUG FUSES
Color tells the size
TRICOMATIC PLUG FUSES
With built-in thermal time-lag element
KLIPLOK CLAMPS
Lock fuses and clips together
TEST CLAMPS
For heavy duty testing
FUSE PULLERS
For safe handling of fuses
AUTOMATIC OILERS
For motors, line shafts, etc.

Send for your new Folder CPF-300 TODAY!
TRICO FUSE MFG. CO., MILWAUKEE, WIS.
In Canada—IRVING SMITH LIMITED—Montreal

TRICO POWDER PACKED FUSES
STOP WASTED KILOWATTS AND WASTEFUL SHUTDOWNS



MASTER GEARHEAD MOTORS

As a motor manufacturer and gear manufacturer all in one, MASTER designs, builds, tests and guarantees the complete Gearhead Motor as a unit. BUY MASTER Gearhead Motors and secure the advantages of compactness, economy, balanced design and undivided responsibility by one manufacturer for long, trouble-free operation. **THE MASTER ELECTRIC COMPANY, DAYTON, O.**

LOOK

TO PAGE FOR THIS SPECIALLY DESIGNED P•12 WING-CHANNEL POST

PAGE FENCE

PAGE *originated* woven wire fence in 1883. Consistent with a record for constant pioneering in fencing, PAGE now offers industry the only fence line post designed primarily for use with chain link metal fabric. Other metal posts are but adaptations of existing structural shapes.

The P-12 Wing Channel Post design provides wider bearing surface for fabric—maximum strength—smart appearance. It exposes no injurious sharp corners. Wings and channel take rigid grip in concrete footing. PAGE P-12 Posts are high carbon steel, heavily galvanized to the high P-12 standard of rust resistance.

5 SUPERIOR FENCE METALS

PAGE FENCE is offered in 5 superior metals to meet all destructive atmospheric conditions. They include Page P-12 Copper-bearing Steel, Page-Armco Ingot Iron, Page-Alcoa Aluminum, Page-Allegheny Stainless Steel in woven wire, and Page genuine Wrought Iron picket fence. The metal best suited to your locality and purpose is impartially recommended by PAGE fence experts.

FENCE FACTS FREE

Mail the coupon. It will bring you illustrated booklet, "Fence Facts," and refer you to nearest of 92 completely responsible Page Fence Distributors located throughout the United States for free consultation, expert fencing service and erection by trained crews.

Page Fence is a product of the Page Steel & Wire Division of American Chain & Cable Company, Inc.

PAGE FENCE ASSOCIATION

Dept. F11, Bridgeport, Connecticut
Please mail me, without obligation, new Free Booklet, "Fence Facts," and name of nearest associated Page Fence Distributor.

Name.....

Address.....

City.....*State*.....

AMERICA'S FIRST WIRE FENCE • SINCE 1883

handle. With all the chips adhering to it, the magnet is held over a container. When the switch is released, the chips fall.

These magnets have increased production, eliminated bad hand cuts and burns, eye injuries, and have cut down maintenance cost of the machines.

They are used on a 220-volt d.c. line. If necessary, they can easily be designed for use on a.c. or 110-volt d.c.—*C. Gunetti,* General Night Foreman, Merco-Nordstrom Valve Company, Berkeley, Calif. ($5 Award)

463

Puts Men's Names on Their Machines

Recently I moved some machines from one department to another. After having them repainted and cleaned, it occurred to me that it might be a good idea to stencil the operators' names on their machines. The words "Operator" and in the case of a helper, "Assistant," were stenciled in small letters and the names in larger letters, the first and last names being printed out in full.

In the first place, I think it is good psychology, as it seems to dignify the position of the two men; secondly, it gives them a sense of security, which makes them feel that they have something more than just a job. It also makes it much easier to learn to know the men's names; not only their fellow-workmen, but the "Big Chief" himself wants to know as many men by their first names as possible.—*A. F. Erickson,* Works Manager, All-Steel Equipment Company, Aurora, Ill. ($5 Award)

464

That High Cost of Training

As an experiment, employment tests were administered during a certain period to applicants *after* they had been hired. Results showed that, as a group, those who failed on the job scored much lower on the tests than those who succeeded. Twenty-five individuals had to be transferred or released with a loss of training expense. In this group, 16 would have been eliminated on the basis of test results, and of the remaining 9, all but 3 failed for reasons not measured by the tests.

The direct labor costs in the needless training of 16 unqualified persons amounted to approximately $1,597. To train the other 9 required about $890, making a total cost for the 25 individuals of $2,487.00. In contrast to this, the total cost of material and clerical work used in meas-

(CONTINUED ON PAGE 164)

BETTER WORKING CONDITIONS

FASTER PRODUCTION

LOWER COSTS

These are the problems of every manufacturer — these are the problems that Westinghouse research, engineering and product application can help you solve.

New ideas, new products, new efficiency in application are being developed constantly. For example, important Westinghouse contributions to industry include these

NEW AND PROVED DEVELOPMENTS

Sterilamp for bacteria control in the food industries . . . saves spoilage

Precipitron to remove atmospheric dust in factories, mines, quarries, mills

Individual machine drives provide peak efficiency for stop and go production

New power switch for spot welders with no moving parts

Bright annealing of high carbon steel without decarburization

Electric furnace developed to study the "creep" of steel and metal alloys

Capacitors to reduce power cost

Nofuze circuit protection saves fuse outage expense

New rectifier to protect underground pipe lines from galvanic action

Dynamic balance in motors

Greater protection of contacts in motor control

Micarta — a laminated plastic, light, strong, tough — insulates like mica

Socket instruments for cutting the cost of analyzing electrical circuits

Transformers completely self protected against lightning and overloads. J-93974

For detailed information on any of these new developments, call your nearest Westinghouse office, or write

WESTINGHOUSE ELECTRIC & MFG. CO.
East Pittsburgh, Pa.

Westinghouse

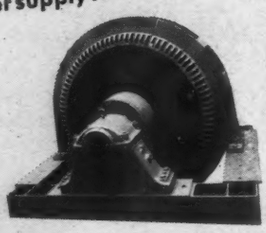
EXAMPLES OF PRACTICAL PARTNERSHIP

SAVES $210 EVERY MONTH

WITH WESTINGHOUSE-DRIVEN AIR COMPRESSOR!

Gardner-Denver air compressor, with Westinghouse synchronous motor, replaces old style steam driven compressor. Result — operating costs reduced, plant power factor improved, making a total saving of $210 per month, plus 66% increase in compressed air delivery. In 35 months, savings pay entire cost of new installation, including compressor and electrical equipment.

Below are shown a few typical examples of Westinghouse products, to meet your electrical requirements from power supply to driven machine.



Synchronous Motor

CS Induction Motor

Combination Line-starter and Circuit Breaker

Gearmotor

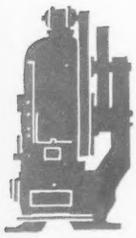
New equipment delivers 66% more air, yet costs less to operate than old-type compressor

This compressed air installation, in a large midwestern industrial plant, again proves the value of replacing outmoded or worn-out machinery with modern equipment. When savings pay entire cost of new installation in 35 months, that's a good investment!

Westinghouse engineers constantly co-operate with machinery builders and customers in designing drives to match the increased efficiency of the new equipment. Together they analyze the problems—and find the profitable answers. On the opposite page is additional evidence of Westinghouse co-operation in turning power into profits.

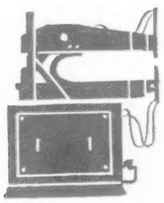
IN CONVERTING *POWER* INTO *PROFIT*

...AND AS *Additional* EVIDENCE...



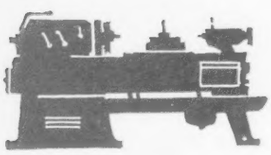
New drawing press cuts material spoilage

A kitchenware manufacturer was losing much expensive material because of wrinkling and tearing, in an outmoded crank-type power press. He invested in new high speed electrically driven equipment. Result . . . he can now use cheaper material . . . spoilage is less . . . production increased . . . and dies last longer.



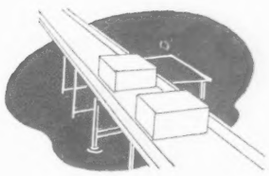
Aluminum spot-welded at one tenth riveting cost

An aircraft manufacturer found that rivets cost from 3 to 4 cents each. With spot welding, all costs except first cost and depreciation were less than 3/10 of a cent per spot. And furthermore, spot-welds stand up better under tension and shear than riveted joints.



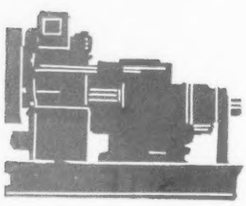
New lathe cuts production time 75%

New high speed turret lathe used in manufacture of stainless steel valves and fittings has cut production time 75%, thus saving overtime and late deliveries. Customers also like greater accuracy and uniformity of the replacement parts.



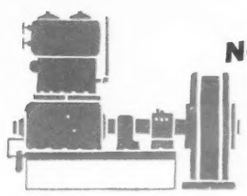
New conveyors reduce handling costs 50%

A large drygoods concern installed a new belt conveyor for handling orders from stockroom through packing operations to shipping department. Handling costs were reduced 50%, floor space saved, work speeded up all along the line, and more satisfactory conditions provided for workers.



New screw machines boost production 300%

After study, a manufacturer scrapped many automatic screw machines that were "running perfectly." By using modern screw machines and improved bar stock they increased production 300%, and cut costs.



New refrigerating equipment saves $25,200 yearly

Engineers recommended installation in an ice plant of new compressors driven by synchronous motors, and also remodeling of freezing tanks. Result was an annual saving of $25,200 and a 50% increase in capacity.

The same engineering skill that helped these manufacturers is available to you. Westinghouse will work with you and your machinery builders to reduce costs and increase production with modern electrical equipment. See your local Westinghouse office, or write to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. Address Department 7-N.

J-93887

Westinghouse

ELECTRICAL PARTNER OF INDUSTRY

W WESTINGHOUSE ELECTRIC

GEARMOTOR STEPS UP THE SPEED OF THIS SHEAR

GEARMOTORS

1. SAVE IN INSTALLATION COST
2. SAVE SPACE
3. SAVE MAINTENANCE
4. SAVE ACCIDENTS
5. SAVE SHUTDOWNS
6. SAVE IN POWER TRANSMISSION

NOW PRODUCES 50 TO 100 MORE FEET PER MINUTE

Power transmitted direct to the shaft through a Westinghouse gearmotor increased production from this flying shear.

Used for cutting plate from strip, the shear was formerly operated by a conventional type drive. The belt had to be tightened to prevent slippage during starting, then the tension relieved when the shear was up to speed.

The gearmotor by eliminating these adjustments made it possible to operate the shear at a speed of 350 to 400 feet per minute—50 to 100 feet faster per minute than the former installation.

The chances are 4 to 1 that gearmotors will save in your power applications. Consult Westinghouse—not only leaders in the development of the electric motor, but makers of precision gears for over 50 years. Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pennsylvania.

J 07066

Westinghouse
Geared Drives
GEARMOTORS · SPEED REDUCERS · GEARING

FIGURES YOU CAN'T AFFORD TO OVERLOOK

Woolen Mill saves $3500

Costs $18 00 • Saves $2400 a month

Shoe manufacturer adds $1,000 extra profit

Fuse-outage interruptions Cost $120 a month

$2,000 a year return on $360 installation

$1500 Circuit Breaker banishes costly delays

Coal production loss Stopped

Automatically protects circuits against severe overloads and "shorts" — without time lost by men and machines and costly fuse replacements.

Safety for circuits
Safety for workmen
Safety for machines
and SAVES many times its cost.

In hundreds of plants Westinghouse Nofuze "De-ion" Circuit Breakers have paid for themselves many times over — reducing lost man hours, stopping the loss of idle machines, lowering maintenance costs.

Be sure you aren't passing up substantial savings. Investigate fuseless circuit protection.

Make a note to look into it today. Call your nearest:

Electrical Wholesaler
Industrial Agent
Electrical Contractor
Motor Dealer

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
EAST PITTSBURGH, PA.

J-20530

Westinghouse *Nofuze "De-ion"* CIRCUIT BREAKERS

MOTORS • LINESTARTERS • CIRCUIT-BREAKERS • SAFETY SWITCHES • PUSH-BUTTONS

Announcing the Westinghouse R L M

SILVERED BOWL DIFFUSER

For Uniform, High Intensity, Trouble-free Lighting of Low-bay Areas . . . at Low Installation and Maintenance Cost.

The *new* Silvered Bowl Diffuser is the answer for manufacturers who have the problem of lighting low-bay industrial areas . . . as in metal working, inspection and small assembly departments; and for all types of bench work that involve precision seeing.

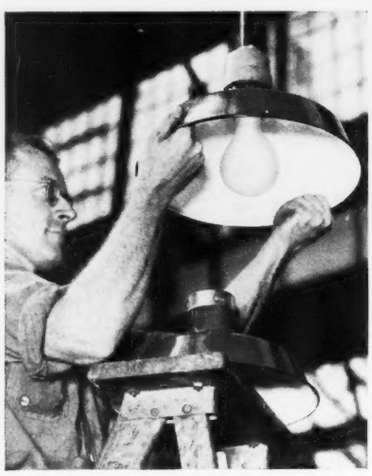
This superior lighting unit was developed jointly by the member companies of the RLM Standards Institute and the Mazda Lamp Manufacturers; and is the *first* fully to utilize the distinctive indirect lighting characteristics of the silvered bowl Mazda lamp. It provides efficient and economical high intensity illumination with low glare at normal vision levels.

As made by Westinghouse, the Silvered Bowl Diffuser is supplied either as a one-piece unit for conduit mounting or with the exclusive new Locklite Hood construction, designed by Westinghouse Lighting engineers. Locklite construction is also being applied to all of the RLM-type units manufactured by Westinghouse, and is especially recommended to simplify and safeguard industrial reflector-installations.

Consult your Westinghouse Jobber for complete details; or write for descriptive literature direct to Westinghouse Electric & Manufacturing Co., Lighting Division, Edgewater Park, Cleveland, Ohio.

Westinghouse is a member of

RLM STANDARDS INSTITUTE



"Lights when it's locked and only when it's locked!". . . Locklite is an exclusive connecting principle that simplifies maintenance, provides greater safety, is easy to wire and install. Locklite is available with the RLM Dome, Deep Bowl and Symmetrical Angle Reflectors; with the Shallow Dome Reflector and Glassteel Diffuser; and with the new RLM Silvered Bowl Diffuser.

WHEN YOU THINK OF *Lighting Equipment* THINK OF

Westinghouse

Plug in... **TO VALUABLE OPERATING FACTS**

Find out the facts that only instruments can tell about motors and electrical circuits — easily, economically, INSTANTLY!

Westinghouse Type "S" Sockets for instruments give you low-cost *instant* access to vital operating information about your power and lighting circuits. In a minute or less you can plug in the required Westinghouse Socket Instrument to obtain facts enabling you to correct low power factor, overloaded or underloaded motors, electrical leaks, faulty process control, excessive machine friction and similar preventable profit leaks.

With Type "S" Sockets installed in the power circuit conduit, simply remove the socket cover plate and plug in *any* instrument for *either* permanent use or test purposes. Send today for full information. Westinghouse Elec. & Mfg. Co., Dept. 7N, East Pittsburgh, Pa.

Send for Booklet B-2136 — explaining how to make instrument connections as easily as you plug a floor lamp into a wall outlet.

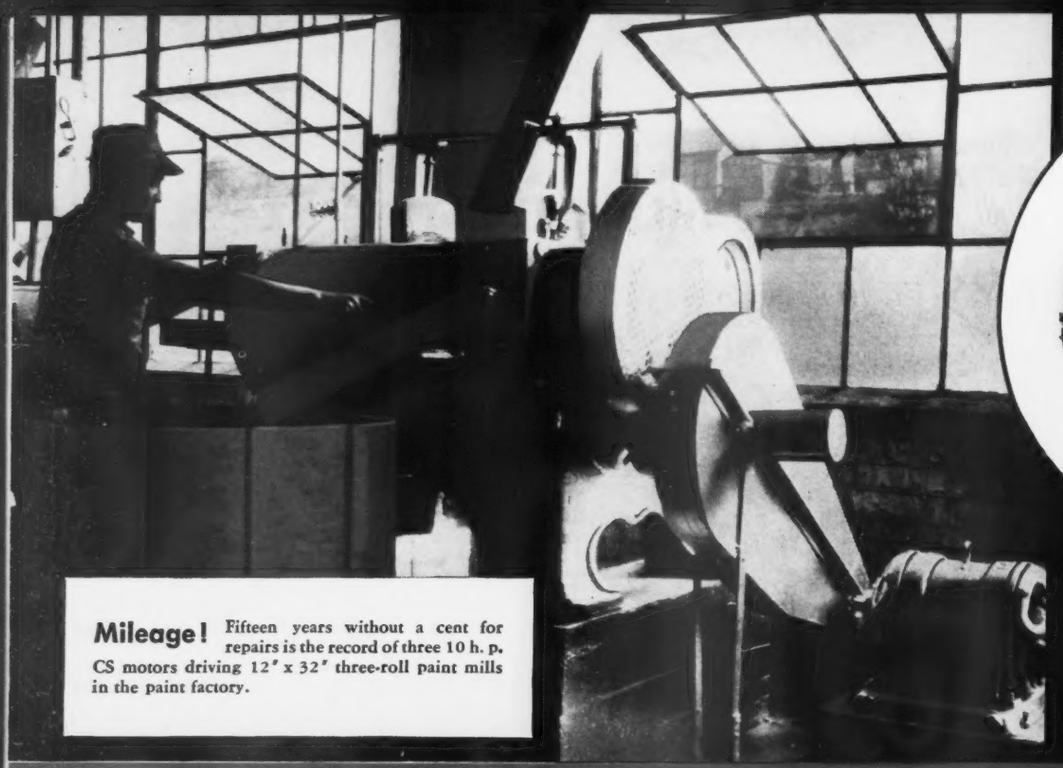
J-40147

METERS · INSTRUMENTS · RELAYS

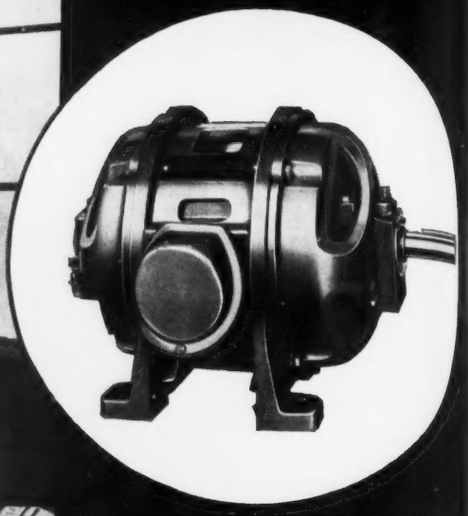
Westinghouse

ELECTRICAL INSTRUMENTS

"The Standard of Accuracy Since 1888"

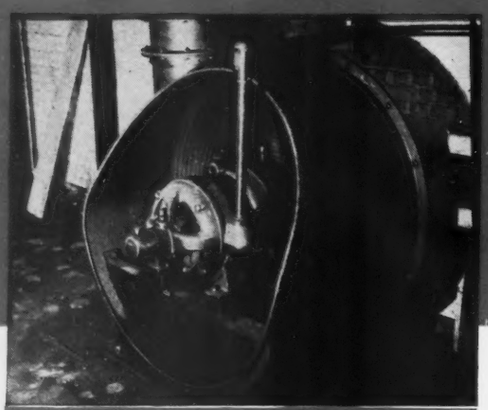


Mileage! Fifteen years without a cent for repairs is the record of three 10 h. p. CS motors driving 12" x 32" three-roll paint mills in the paint factory.

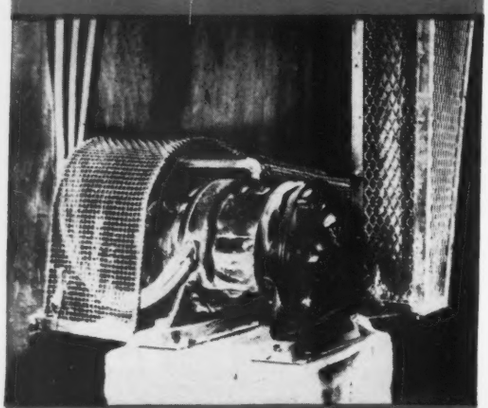


Convert the turning action of an electric motor into distance — you will be amazed at the mileage piled up during its lifetime. Extra years of service, extra mileage is built into Westinghouse motors.

MORE "Mileage" WITH WESTINGHOUSE



Mileage! Operating seven days a week for over eleven years, this motor has supplied air to a continuous kiln. Although exposed to coal dust, it has never been shut down for repairs.



Mileage! Driving a high speed mill in a ceramic plant, these motors run 9 hours a day at full load rating. The original windings and bearings are still intact, in spite of constant exposure to fine abrasive dust, during their nine years of service.

When buying a motor, specifications may be exactly right — but how about the mileage — the years of trouble-free service the motor will deliver?

You can be sure of mileage — of long life, low maintenance, and service under any and all operating conditions, when you specify Westinghouse.

For only Westinghouse motors offer the three essential features that mean More Mileage:

1. **TUFFERNELL INSULATION:** Dual protected windings and taped end turns give extra protection against mechanical and electrical damage.
2. **SEALED SLEEVE BEARINGS:** Exclusive Westinghouse bearing seal keeps clean oil in; seals dirt, dust and grit out.
3. **RIGID ONE-PIECE FRAME:** Mechanical parts carry the mechanical load, protecting electrical parts from vibration, torque and strain.

For full details on all types and sizes, simply call your nearest:

Westinghouse Office — Electrical Wholesaler
Motor Dealer — Industrial Agent

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, EAST PITTSBURGH, PA.

J-20525

FROM POWER LINE TO DRIVEN MACHINE
YOU ARE ALWAYS SURE WITH

Westinghouse

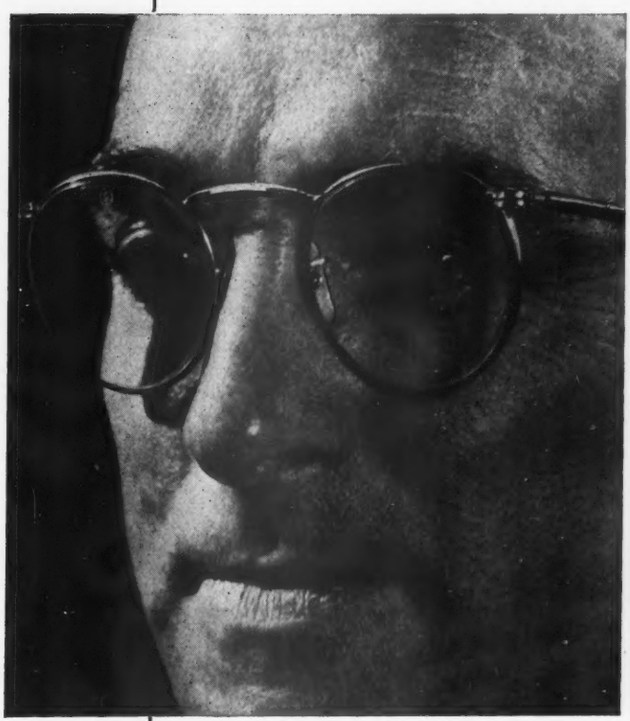
MOTORS * CONTROL * CIRCUIT PROTECTIVE EQUIPMENT

Keep Your Plant Clear of Lost-Time Eyes with

AMERICAN OPTICAL GOGGLES

Impose industry's 1937 eye-time loss on one plant . . . and it would be shut down for nearly 11 centuries. This represents only *recorded* eye-accidents . . . does not include the dozens and hundreds of minor or near-accidents that always precede a serious one . . . does not include the time lost by eye-diseases that are caused or revived by injury.

Now here's the other side of the question: For the average cost of one lost eye, you could buy eye-protection for 1,000 men . . . *American Optical Eye-Protection* that is planned, economical, *backed by the only complete service.* Call in the trained industrial representative from the nearest American Optical branch office.

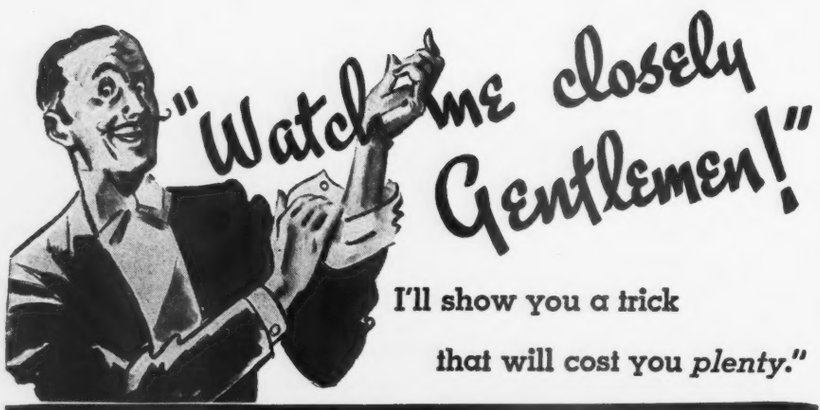


Ful-Vue Goggles {patented} are popular with workers for their lightweight comfort and modern style. 3 sizes, to fit all men and women workers. 2 of these sizes may be fitted with wire-mesh side shields.

AMERICAN OPTICAL COMPANY

Manufacturers, for more than 100 years, of products to aid and protect vision. Factories at Southbridge, Mass. In Canada, Consolidated Optical Co., Ltd. Branch offices in all principal industrial centers

5437



Dividends are assured . . . management is in line for bonuses . . . directors have expressed satisfaction.

Plant operating at capacity . . . deliveries going out on schedule . . . profits good . . . prospects splendid.

Fire strikes in the finishing room . . . damage—about $2,000 . . . production held up for 10 days while new equipment is installed.

Production schedules collapse . . . 2 big seasonal orders cancelled, because of failure to meet stringent delivery requirements . . . Result —a substantial operating loss.

Little fires cost big money. LUX carbon-dioxide extinguishers kill electrical and flammable liquid fires *faster than any other known extinguishing agent.*

Lux harms neither men nor materials. Lux portable extinguishers or Lux Fixed Systems are specified for protection of heavy electrical equipment, of lacquer hazards, of vats, chemical processes.

There's very little loss when a fire's snuffed out in a few seconds. Lux will do that job for you.

Free brochure, "Lux Makes The Difference" tells how Lux protects profits. Write today.

Walter Kidde & Company

52 West Street, Bloomfield, N. J.

(CONTINUED FROM PAGE 154)

uring all applicants (2,683) during this period was $813.

Selecting a group of employees by interview only resulted in 2.7 times as many failures as did hiring an equally large group during the same period with the aid of employment tests. Hiring and training costs for the unsatisfactory employees amounted to approximately $5,400 in the first group and only $2,000 in the second, or tested group.

However, the selection of a greater number of competent employees has other advantages beyond this money saving. Qualified employees learn more quickly and require less training, produce more and better products, waste less, and have fewer accidents than employees who are unqualified.—*B. R. Johnson*, International Business Machines Corp., Endicott, N. Y. ($5 Award)

465

Switch to Stainless Steel Saves 4 Operations

Handles and breakers for ice cube trays were formerly made from 0.040-lb. sheet brass. The operations were: (1) Blank, (2) form, (3) clean, (4) polish, (5) cut down, (6) nickle plate, (7) buff, (8) chrome plate, (9) buff and inspect. Parts were therefore expensive to make.

We have now changed the material from brass to stainless steel, and are able to eliminate all the costly finishing operations. The operations now are: (1) Blank, (2) tumble, (3) form, (4) clean, (5) ball burnish.

The stainless steel part does not have quite the high luster that the old chrome-plated part had, but it is satisfactory. It is true that the basic material is more costly per pound, but we were able to reduce the gauge thickness from 0.040 to 0.025, thereby keeping the material cost on a par with the old method.

It was necessary to make changes in the forming dies. Because of the density of stainless steel, it required relieving the dies about 0.005 in.

Our reduction per tray, which includes two handles and one breaker, was $.097.—*L. G. Bergstrom*, Rate & Cost Reduction Department, Westinghouse Electric & Manufacturing Co., East Pittsburgh. ($5 Award)

466

They Compete to Stop Waste

In one department in our plant we manufacture multi-wall paper bags, constructed of four or five plies of various weights of kraft paper. An example is the bag used for portland cement. Waste in this depart-

Users TELL YOU HOW To

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

INSURE PROFITS

★

PRODUCTION CONTROL

"Approximately 2000 orders must be scheduled and checked at various control points several times daily. McCaskey Production Control provides us with instant visible records showing the location at any time of all work-in-process with minimum clerical effort. Our expediters handle several times the amount possible with previous methods." **Tuttle & Bailey, Inc., New Britain, Conn.**

"Visible control has been established over work-in-process by part numbers and operations, some parts having as many as forty operations. McCaskey Control provides instant accurate check of counts at all operations without posting of production figures." **Chicago Flexible Shaft Co., Chicago, Ill.**

MACHINE CONTROL

"Scheduling one to ten jobs a day to 120 machines involved frequent headaches until McCaskey Machine Control was adopted. We now can determine at a glance the total hours of work on hand for each machine. Jobs are scheduled so that machines are loaded evenly and used most advantageously. Delivery dates are met and precedence is readily given to rush jobs. When production is at a peak . . . quickly indicates the shifts required to clear it up without delay. Equally useful for determining hours per week available when volume is down. Results secured with minimum of work and small original investment." **Gar Wood Industries, Inc., Detroit, Mich.**

PERPETUAL INVENTORY

"McCaskey methods compel our clerks to keep dual inventory of 7000 items up-to-date. Cuts clerical routine and reduces errors to negligible percentage. We are satisfied that it is better than our old system of stock bin cards with corresponding card records in the office." **International Projector Corp., New York, N. Y.**

"McCaskey Inventory Control has enabled us to keep sufficient stock of many thousands of manufacturing and service items without excessive stores and provides our accounting department with accurate data for distribution of material charges without additional writing or delay." **Florence Pipe Foundry & Machine Co., Florence, N. J.**

COST AND PAYROLL DISTRIBUTIONS

"McCaskey Controls give us the accurate records required to promptly measure departmental efficiency in comparison with standards at minimum clerical expense. Data for distributing both productive and non-productive labor departmentally, for accumulating labor costs on individual orders, and for payroll preparation are available without the multiple postings necessary with most systems. Variance from standards and other reports are provided for operating heads without delay." **St. Charles Manufacturing Co., St. Charles, Ill.**

"Actual and standard labor costs are available a few minutes after the completion of each operation. Within an hour after quitting time, the cost department knows just what the day's operations cost." **Mullins Manufacturing Co., Salem, Ohio.**

TOOL CRIB AND TOOL INVESTMENT CONTROL

"Before McCaskey Control was adopted, a large number of tools were lost, strayed or stolen every year. This loss has been entirely eliminated. Breakage has been reduced and inventory maintained on an economical level. McCaskey is speedy in operation and crib attendants and workmen both like it. The original investment has been saved many times." **SKF Industries, Inc., Philadelphia, Pa.**

"McCaskey Control has ended all disputes between employees drawing tools and crib attendants. Inaccuracies and limitations of the brass check system were a constant source of irritation, but arguments now are a thing of the past. Tool investment has been reduced . . . tool breakage cut 50% . . . service is speedier . . . time spent at window by otherwise productive employees minimized." **Webster Electric Co., Racine, Wis.**

★ Many others have obtained comparable results from McCaskey Controls. The principles on which they are based have been proven sound for the most exacting requirements. Although they do not change, their application is sufficiently flexible to meet the needs of plants large and small. About yours—a qualified McCaskey representative will gladly confer with you—no obligation. Write for data today.

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

Fig. 732. Pat'd & Pat's Pending
Drawer is extra

It costs so little for a *real* WORK-BENCH . . .

It doesn't pay to fuss around with the home made variety

Do you realize that you can get an all-steel work-bench, of the sturdiest construction, one that will give a lifetime of use and in practically any style you need, at a cost about equal to what it would cost to build a makeshift wooden structure? It's true, you can by specifying the . . .

"HALLOWELL"
STEEL WORK-BENCH

There are over 1300 different combinations for your choice. The smooth steel top will take all the punishment you can give it without splintering or chipping. Furthermore, "Hallowell" Benches can be taken apart, moved and re-set-up. Try and do THAT with a wooden one . . . all you'd have left would be a pile of splintered wood, fit for the furnace. Write us for the catalog that tells all about them.

STANDARD PRESSED STEEL CO.

BRANCHES: BOSTON, DETROIT, INDIANAPOLIS
JENKINTOWN, PENNA.
Box 546
BRANCHES: CHICAGO, ST. LOUIS, SAN FRANCISCO

YOU MAY SAY—

"Our Machines Keep Busy"

YES, BUT *How* BUSY?

You'll never know *exactly* until you install the *Servis Recorder.*

It Tells When Each Machine Was Working or Idle—*and How Long!*

It shows up *all* delays—big or little. See how "time down" stands out on the chart below. You can't miss it. You can't help but reduce it! Suppose you could reduce idle time on all your factory machinery merely 10 minutes a day! What would it amount to in a year—or even a month! More than you will ever save by "little economies." The little "time clock for machinery," the *Servis Recorder,* bolts or clamps right on the machine itself—no ink, no pencils, no electric wires. Send for folder, "A Busy Plant."

THE SERVICE RECORDER CO.
1422 Euclid Avenue, Cleveland, O.

The Servis Recorder

The "Time Clock" for Machinery

ment had been quite high, so we called the machine operators in this department together and presented the figures to them, and asked for any suggestions they might have toward reducing the waste.

They, in turn, asked if it would be possible to have a breakdown every month of each operator's production and waste. We had been giving them from time to time the total of each machine for the month. As different operators run the same machine on different shifts, they were interested in finding out which ones were making the most waste.

Since then we have given each man a report of his production and waste for the month, and also the total figures of all the operators, showing each individual's percentage. It has created a friendly competitive spirit among the men and each one has tried to keep his waste lower than the rest. The result is that the waste is down almost to a minimum. It has amounted to a savings of several hundred dollars in a short time, and over a period of a year it will amount to a great deal.—*J. H. Lawrence,* Cost Department, The Raymond Bag Company, Middletown, Ohio. ($5 Award)

467

Trebles Life of Grinding Wheels

In the cleaning department of our foundry we operate five grinding stands equipped with 20 x 2 x 1½-in. wheels. Previously, these stands were all run at the speed recommended for new wheels, with the result that as wheels became worn, grinding time was longer and metals had to be held against the wheels with considerably more pressure in order to handle the same amount of work.

In order to speed up production and reduce costs we rearranged the spindle speeds of these stands. The first spindle was checked for the recommended speed of a 20-in. wheel. The second spindle was run at greater speed so that 17½-in. wheels used on it could maintain the same surface speed as the 20-in. wheels. In the same manner, the third spindle speed was increased to take 15-in., the fourth 12½-in., and the fifth 10-in. wheels. By moving the wheels from spindle to spindle as they become worn, a 20-in. wheel can be worn down to 8 in. before being discarded. And approximately the same surface speed is maintained at all times.

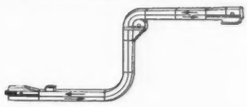
A man was detailed to check the diameter of all wheels with gages every four days and make the necessary changes. As a safety precaution heavy rods were fastened to each

Now...1 conveyor successfully conveys

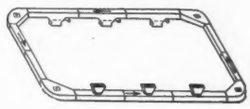
HORIZONTALLY AND VERTICALLY

HORIZONTALLY AND ON INCLINE

HORIZONTALLY, VERTICALLY AND HORIZONTALLY

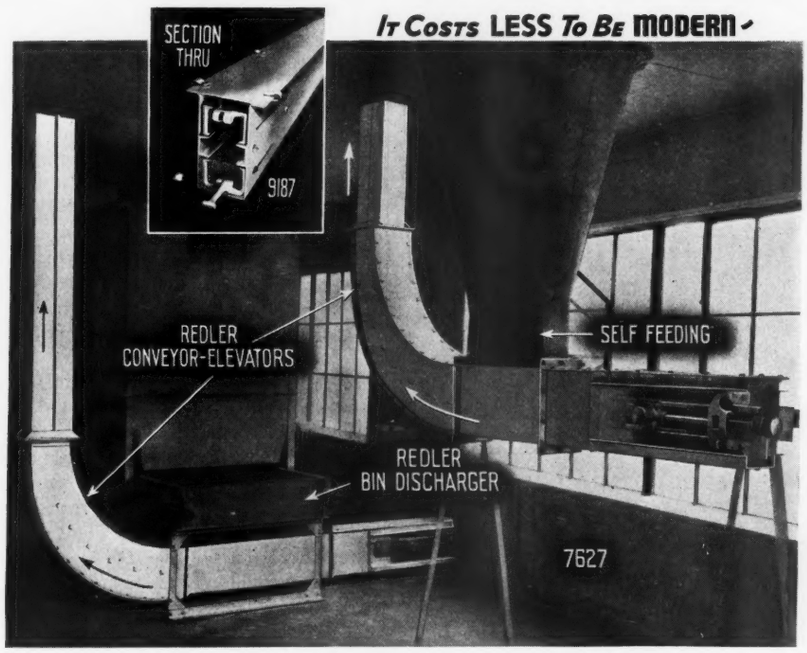


IN CIRCULAR FASHION



REDLER CONVEYOR-ELEVATORS

It Costs LESS *To Be* MODERN -



Pulverized, granular and small lump materials are conveyed *in any direction* in one REDLER Conveyor-Elevator. REDLERS convey gently, *en masse*, without breakage. They are *enclosed* and *dust-tight*. They are also *self-feeding*. And *compact* REDLERS require only ¼ to ½ the usual space.

Having no air space to create explosive mixtures, REDLERS *avoid explosions*. 10,000 REDLERS in use have a record of not a single explosion.

Here are some of the hundreds of materials successfully handled in REDLERS: Aluminum hydrate, bauxite, casein, cellulose acetate, cement, coal, cork, fly ash, fullers earth, lime, mica flakes, plaster of paris.

HAVE YOU THIS VALUABLE ENGINEERING CATALOG?

Here are 40 pages of engineering information on the modern conveying-elevating unit — the REDLER, which you can't afford to be without.

Includes complete tables to enable you to specify proper size REDLER and horsepower needed. *Send for your free copy now.*

CONVEYING • ELEVATING • SCREENING • TRANSMISSION EQUIPMENT

STEPHENS-ADAMSON MANUFACTURING COMPANY

1 RIDGEWAY AVENUE

LOS ANGELES, CAL. AURORA, ILLINOIS BELLEVILLE, ONTARIO.

STEPHENS-ADAMSON MFG. CO.
AURORA, ILLINOIS (F-11)

We would like copy of your 40-page engineering catalog on REDLER CONVEYOR-ELEVATORS..... ☐

Send us your 120-page handbook on Belt Conveyors, Bucket Elevators and auxiliary equipment. ☐

NAME _____

ADDRESS _____

These four authoritative books are much more than mere catalogs. They are filled with engineering data that supply a ready source of technical reference and point out genuine shortcuts to operating and maintenance economies.

No matter what kind of mill or factory operation you are engaged in, you should know all about the distinctive features of ***American Steel Split Pulleys—Wedgbelt Drives—Tension Control Motor Bases—American Pressed Steel Hand Trucks.***

Send for these catalogs today. You will find them a very practical addition to your technical library. There is no obligation, of course. The American Pulley Company, 4200 Wissahickon Avenue, Dept. 2, Philadelphia, Pa.

MODERN PTC GROUP DRIVE

AMERICAN
PULLEY COMPANY

stand, which extend out from the spindle a distance equal to the radius of the largest wheel that can be safely used on that stand.

Savings from this were twofold: Production time was kept up to that obtained with new wheels, and wheel life was increased three to four times. —*William Campbell*, Works Manager, T. McAvity & Sons, Ltd., Saint John, N. B. ($5 Award)

468
Safety Sign Stops Mishaps

During shutdowns, or whenever it is necessary to do work on transmission equipment, a safety sign is hung on starters. Its use eliminates accidents and minimizes delays to production men.

In its several slides are the names of the trades of the men working on repairs, as electrician, millwright, steamfitter, etc. When a man takes one of these signs to a repair job, he turns the slide showing his occupation out. Any other man coming to work on the job does likewise.

As they finish, each man in turn reverses his slide, leaving the blank side out. Last man to finish knows that the line is clear, removes the sign, and starts the motor.

Signs are made of sheet metal, with edges folded over to give rigidity. There are enough of them in the maintenance department so that each man going out for service can take a complete sign with his truck and tools.—*H. W. Benton*, Plant Engineer, Pratt & Whitney Division, Niles-Bement-Pond Company, Hartford. ($5 Award)

469
Control in the Finishing Room Saves 15%

Factors having a direct bearing on finishing material costs are viscosity, temperature, pressure, application, and skill of operators. When making an analysis for cost reduction, these factors must be carefully studied. To this end the following should be done:

1. Temperature of mixing room maintained high enough to keep viscosity of material within range.
2. Fluid or material pressures at tanks and guns set at proper point.
3. Air pressures at guns adjusted according to type of material to be sprayed.
4. Material flow controlled by proper adjustment of guns. Each gun adjusted according to type of surface. Operations broken down so one operator sprays wide surfaces, another narrow.
5. Thickness of coating determined

(Advertisement)

Well Planned?

Taking the efficiency of existing storage and materials handling methods for granted often results in fearful wastes in man hours, floor space, inventory, insurance and errors.

By H. B. SPACKMAN, V. P.
in Charge of Sales, Lyon Metal Products, Incorporated

"FEW PLANTS are so efficiently laid out," says a leading tool manufacturer, "that an open-minded analysis will fail to show places where improvements in methods and equipment will result in speeding production, conserving floor space, and saving man power. For instance, such a survey of the storage facilities in our very modern plant proved a real eye-opener . . . and a most profitable move. It disclosed that . . . by replacing wood shelving with adjustable steel shelving . . . we could squeeze out an additional 3,200 sq. ft. of much-needed manufacturing space."

Additional examples, illustrating how revisions of storage and materials handling methods have resulted in immediate substantial savings and opened the way to extra profits, might be drawn from practically every industry. The following typical cases, selected at random from recent case studies, provide specific figures indicative of the benefits so frequently gained by "open minded analysis."

$18,000 Saved by Candy Manufacturer

By the installation of the most advanced type of storage and distributive equipment a world-famous maker of fine candies effected tremendous savings in storage space, simplification of stock transport, and reduction of breakage resulting from too frequent trucking and shifting.

At the close of one year's operation with this new equipment . . . used according to a plan developed by Lyon engineers . . . a saving of $18,000 had been effected. And this figure will be duplicated each year for many years, as there is no depreciation on the Lyon Steel Bin and Shelving Units around which the system operates.

Fast-Growing Drug Chain Saves 28% in Floor Space

Operating numerous stores and a mail order division . . . carrying over 25,000 items . . . this highly successful organization has a constant and complex stock handling and storage problem. Subjecting apparently efficient and economical methods to a survey by Lyon Storage Engineers resulted in (1) a saving of approximately 27% of floor area used for surplus stock storage; (2) stock handling so simplified and accelerated that all mail orders are easily handled the same day they are received; (3) equipment depreciation and fire insurance cost substantially reduced.

Mr. H. P. Knowles, Purchasing Agent, The Fafnir Bearing Company, dug for storage equipment facts and achieved these profitable results.

● "By the installation of Lyon Steel Shelving," says Mr Knowles, "we were able to keep within our physical limitations of buildings during a period in which a large increase of business demanded extra floor space for new manufacturing equipment."

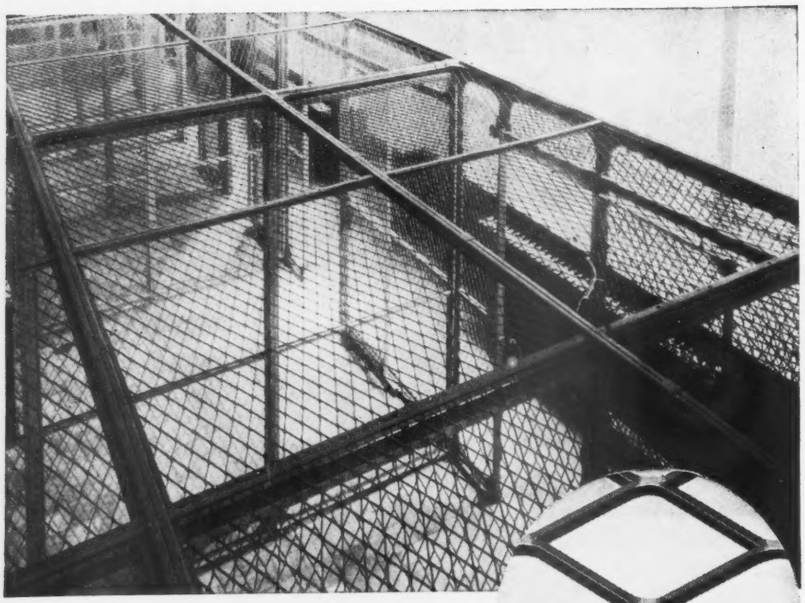
Whether your problem is one of space conservation, product protection, service acceleration, or conservation of man hours, a survey of storage and materials handling methods is in order. It costs you nothing to have an experienced Lyon representative help you make this survey. And, you are under no obligation to adopt his recommendations. His job is to help you get the facts. Your judgment alone determines subsequent action.

LYON METAL PRODUCTS, INCORPORATED
AURORA, ILLINOIS

LYON STORAGE EQUIPMENT *Service*
LYON METAL PRODUCTS, INCORPORATED, Aurora, Illinois

Lyon Metal Products, Incorporated
1211 River St., Aurora, Ill.
Please send full particulars on your no-cost, no obligation check up on storage and materials handling methods.

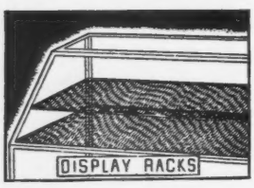
Name_____
Address_____
City_____
State_____

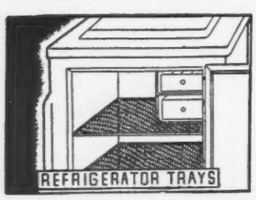


Protect your workmen —Prevent property loss with **MILCOR** Expanded Metal

— stronger than woven wire, lower in cost than perforated metal—more satisfactory than either—

For the construction of machine guards, stock room enclosures, treads, catwalks, window guards, factory shelving — Milcor Expanded Metal can be easily handled, quickly worked. It has great strength, yet can be easily formed in any desired shape, for countless purposes, with amazing economy. It gives adequate protection, yet permits light, ventilation, and vision.





In addition to the countless applications for factory maintenance purposes, Milcor Expanded Metal *improves the appearance and salability of your finished product.* It is used extensively for refrigerator trays, in air conditioning equipment, for display racks, metal porch furniture, etc. — as the sheets can be cut in any direction to form pieces of varying sizes. The strands cannot ravel or loosen.

Milcor Expanded Metal is available in ½", ¾" and 1½" standard mesh, both expanded and flat expanded — 26 to 9 gauge stock in sheets up tc 8 feet square. Milcor offers special fabricating facilities for unusual jobs — and an engineering staff to help you with your problems . . . Once you use this material, you find many other applications for it. It pays to keep a stock on hand. Write for the Milcor Expanded Metal Kit, today.

F-44

MILCOR STEEL COMPANY

MILWAUKEE, WISCONSIN CANTON, OHIO

Chicago, Ill. Kansas City, Mo. La Crosse, Wis.

Atlanta, Ga. New York, N. Y.

so number of passes per surface may be standardized, insuring a uniform finish and saving in materials.

6. Operators trained in proper gun handling.

7. Surface area for each product determined.

8. Standards set.

To maintain control of the material consumption the amount of material used should be checked against the coverage in square feet, and the figures posted on a graphic chart. This should be done daily. Any marked deviation from standard will readily show up, and an investigation should be made as to the cause.

Posting a copy of the chart in the spray room has a psychological effect on operators. They show a marked interest in the results. Installation of this control plan increased coverage per gallon over 15 per cent.—*S. R. Teranes* and *N. Schroeder,* Hamilton Mfg. Co., Two Rivers, Wis. ($5 Award)

470

One Packing Outlives Four

To cut high maintenance costs and eliminate time lost in frequent repacking of belt-driven, babbitted-sleeve-bearing centrifugal pumps was an objective of this factory. It was found that the bearing trouble was caused by uncontrollable shaft end thrust.

A non-expansion roller bearing was installed as the outboard bearing of the pump, replacing the original bearing. An arc-welded pedestal holds the new bearing which clamps to the shaft, positively controlling the end thrust. While changes were being made, the other two bearings were changed to bronze solid-sleeve type, care being taken to design the oil grooves with well-rounded edges.

With this set-up the sleeve bearings play no part in controlling the thrust. The shaft floats freely through them, and they care for the shaft expansion or contraction caused by changes in the temperatures of liquids pumped.

This installation, we have found, positively controls end thrust, with the following results:

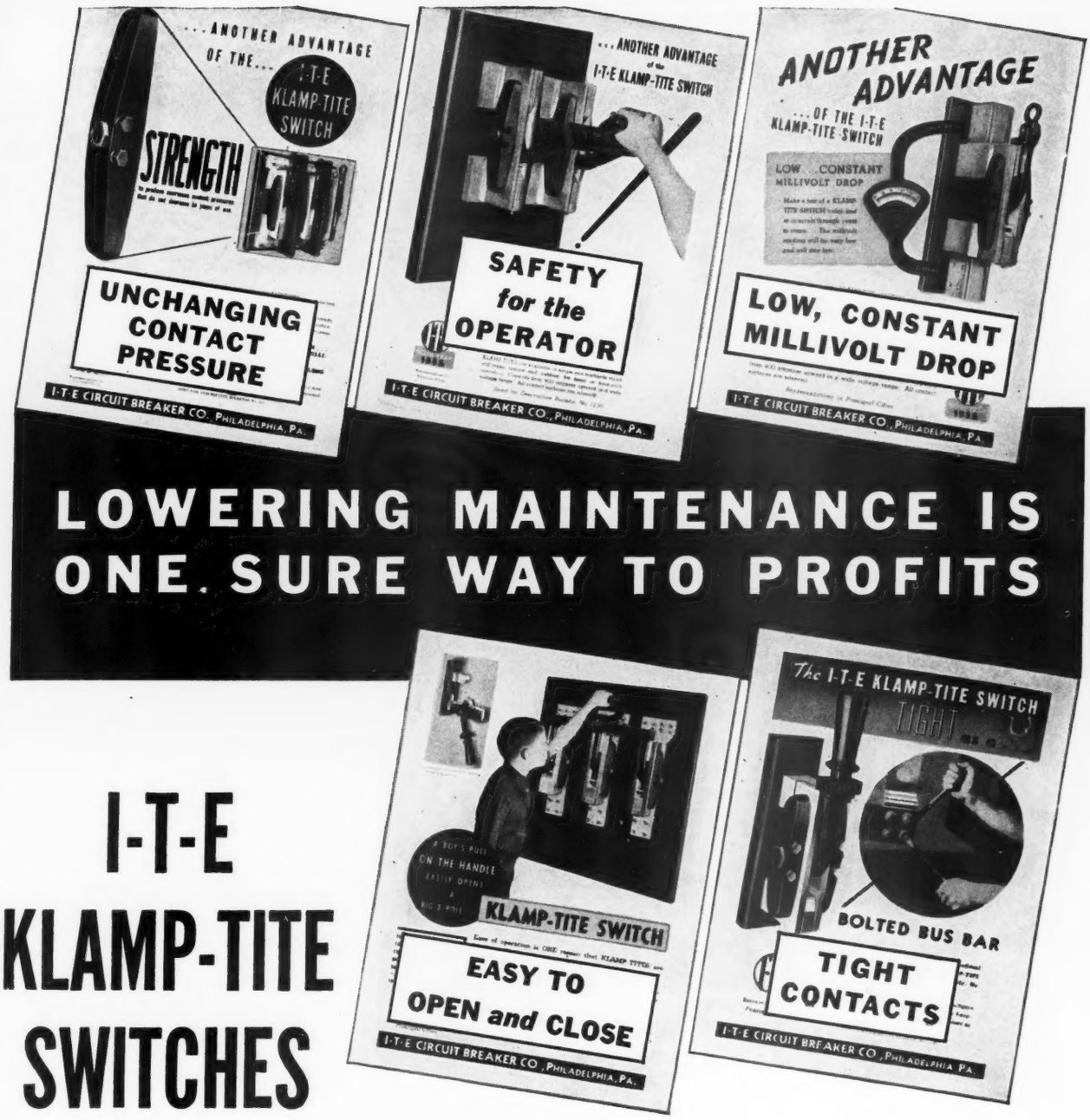
1. No more hot bearings.

2. No more worn impellers and seal rings.

3. No "hammered out" bearings.

4. Fewer costly delays caused by need for repacking.

These pumps have operated continuously for three to four months, pumping 90-deg. C. liquid with one packing, where before, with conventional-type bearings, it was necessary to repack four to six times during


...ANOTHER ADVANTAGE OF THE... I-T-E KLAMP-TITE SWITCH
STRENGTH
UNCHANGING CONTACT PRESSURE
I-T-E CIRCUIT BREAKER CO., PHILADELPHIA, PA.
...ANOTHER ADVANTAGE of the I-T-E KLAMP-TITE SWITCH
SAFETY for the OPERATOR
I-T-E CIRCUIT BREAKER CO., PHILADELPHIA, PA.
ANOTHER ADVANTAGE
...OF THE I-T-E KLAMP-TITE SWITCH
LOW CONSTANT MILLIVOLT DROP
LOW, CONSTANT MILLIVOLT DROP
I-T-E CIRCUIT BREAKER CO., PHILADELPHIA, PA.

LOWERING MAINTENANCE IS ONE SURE WAY TO PROFITS

I-T-E KLAMP-TITE SWITCHES

merit a place in your plans

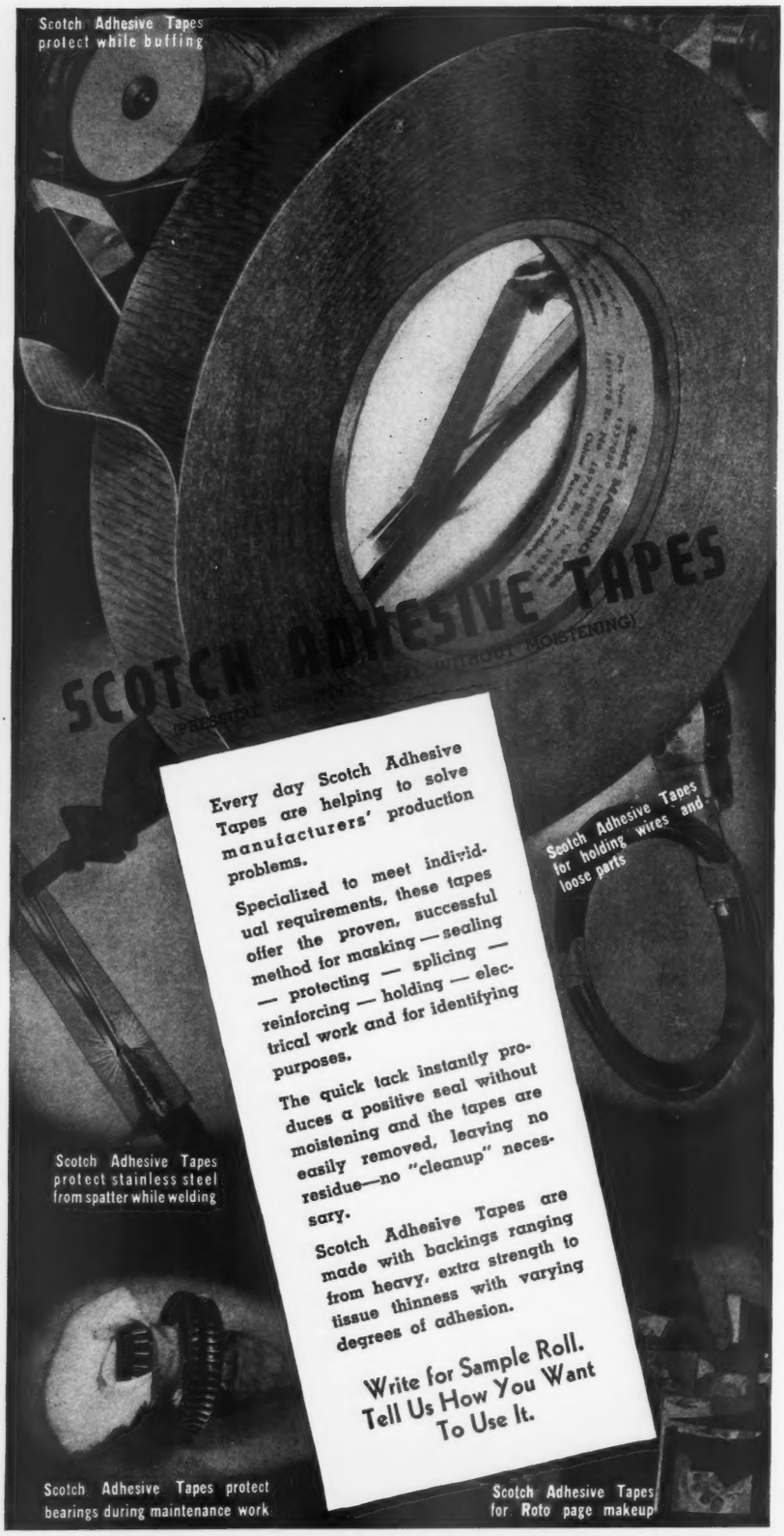
When power flows through a Klamp-Tite Switch, you are assured of the advantages of low maintenance . . . uninterrupted operating schedules through freedom from costly breakdowns.

Know more about the reasons why industry is replacing conventional-style switches with Klamp-Tites. We'll gladly send you Bulletin 238 giving details.

KLAMP-TITES are available in single and multipole standard types, indoor and outdoor, for hand or hook-stick operation. Capacity from 400 amperes upward in a wide voltage range. All contacts are silvered.

Representatives in Principal Cities

I-T-E CIRCUIT BREAKER CO., PHILADELPHIA, PA.


Scotch Adhesive Tapes protect while buffing
SCOTCH ADHESIVE TAPES
Every day Scotch Adhesive Tapes are helping to solve manufacturers' production problems.
Specialized to meet individual requirements, these tapes offer the proven, successful method for masking — sealing — protecting — splicing — reinforcing — holding — electrical work and for identifying purposes.
The quick tack instantly produces a positive seal without moistening and the tapes are easily removed, leaving no residue—no "cleanup" necessary.
Scotch Adhesive Tapes are made with backings ranging from heavy, extra strength to tissue thinness with varying degrees of adhesion.
Write for Sample Roll. Tell Us How You Want To Use It.
Scotch Adhesive Tapes for holding wires and loose parts
Scotch Adhesive Tapes protect stainless steel from spatter while welding
Scotch Adhesive Tapes protect bearings during maintenance work
Scotch Adhesive Tapes for Roto page makeup

Scotch Adhesive Tapes made and patented in U.S.A. by

MINNESOTA MINING & MFG. CO.
SAINT PAUL Branches in Principal Cities MINNESOTA
The Desire To Serve The Ability To Produce

CANADIAN DUREX ABRASIVES, Ltd., 154 Pearl Street, Toronto, Canada

this period.—*C. J. Edwards,* Master Mechanic, Utah-Idaho Sugar Co., Chinook, Mont. ($5 Award)

471

No Overtime for Maintenance

In reducing maintenance costs, full use of maintenance men is difficult to secure 100 per cent of the time. The old theory of maintaining a fair-sized crew to be available in case of breakdowns seems out of date. It necessitates finding fill-in work for these men to do, some of which is not necessarily essential.

The short cut is so simple that it has not always been done. It means setting a maintenance crew below the estimated required number, allowing the extra work to accumulate until an off-day during slow times; and having this work done during full working times by outside contract, at perhaps 5 per cent above shop cost.

In this way overtime at high premium can be avoided and the maintenance man hours kept down. Of course the whole production organization has to cooperate to make this system work.

You may say that this should have been done as standard practice, but the fact is in about 90 per cent of industrial plants it is not done. Maintenance crews for possible failures have been classed as "insurance" protection, and insurance of any kind can be carried too high in relation to the probability of loss.—*H. W. Lormer,* Works Manager, Willard Storage Battery Company, Cleveland. ($5 Award)

BUILDINGS AND SERVICES

(CONTINUED FROM PAGE 104)

ment. Naturally, the quality of the housekeeping is a direct reflection, good or bad, on the foreman. Installation of these signs automatically eliminated the need for any prompting by the management. The foremen now compete with each other for the honor of having the cleanest and most orderly department.

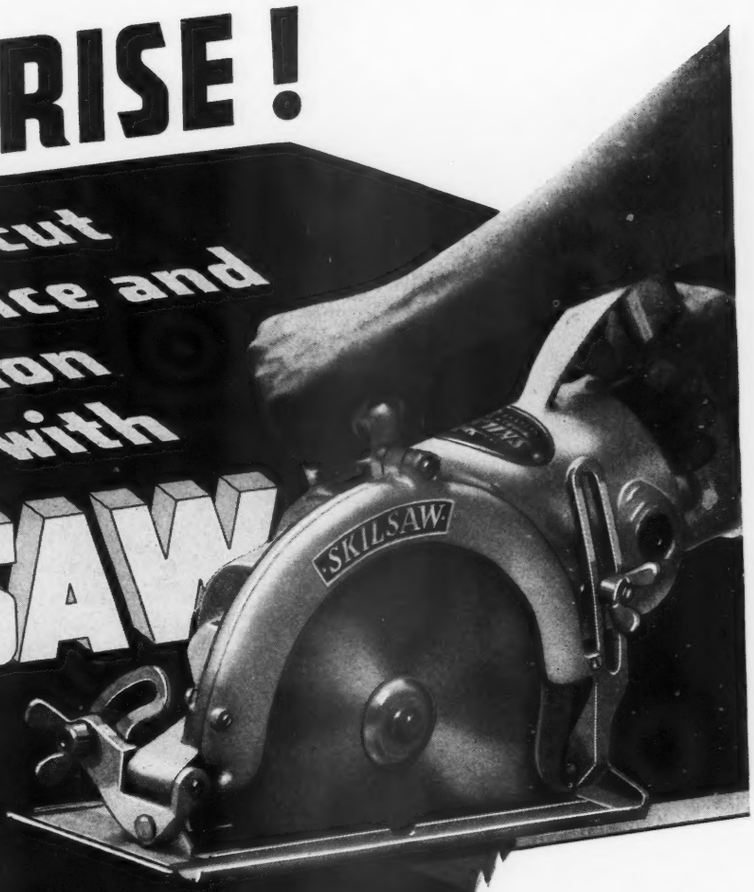
472

Metal Connectors Save Time

At the Pelican Cracker Factory, New Orleans, a new mezzanine floor had to be built over part of one of the main floors. This plant operates 24 hours a day, and construction work had to be carried on without any interference with production. The building is old, and because of settling and differences in the dimen-

PROFITS RISE!

...when you cut maintenance and production costs with SKILSAW



SAVES TIME AND MONEY IN EVERY INDUSTRY . . . ON EVERYDAY SAWING JOBS!

● Rips out 60 ft. of 3 in. old maple flooring *in ten minutes!* This would take 2½ hrs. with hand saw and crowbar.

● Grooves upright staves in wood tank manufacturing. One user *saves* $24 *a day* cutting grooves 2 in. by 1¼ in. deep.

● Cuts lead 1 in. thick at the rate of 2 *ft. per minute!* Also cuts copper, aluminum, steel and lead-covered cable.

TAKE IT TO THE JOB AND SAW 10 TIMES FASTER!

With SKILSAW you speed up ALL your sawing . . . save considerably on material handling—you reduce labor costs . . . *so you increase profits!* You can use it anywhere in the plant for cutting old flooring, trimming doors, opening shipping cases, cutting freight car bracing and machinery skids . . . and for many production sawing and grooving jobs.

In every industry SKILSAW is the preferred electric handsaw because it has more power, is built stronger, will do more sawing jobs. Plugs into any light socket. MADE IN 9 POWERFUL SIZES for cutting wood, metal, stone and compositions.

SKILSAW, INC.

5033-43 Elston Avenue, Chicago

214 E. 40th St., New York ● 52 Brookline Ave., Boston ● 1429 Spring Garden, Philadelphia ● 1253 S. Flower St., Los Angeles ● 2065 Webster St., Oakland

SKILSAW

SAVE MONEY IN EVERY INDUSTRY!

PORTABLE ELECTRIC TOOLS

· SAWS · DRILLS · BELT SANDERS · DISC SANDERS · GRINDERS · BLOWERS ·

Sold by leading distributors of mine, mill, hardware and contractors' supplies.

PROPER ILLUMINATION

For Shelves and Bins in Narrow Aisles

THE STOCKLITE

● **What a difference it makes in quicker and more accurate handling of orders when stock clerks can read labels, small parts numbers or typewritten slips anywhere in stock bin aisles! And it costs so little to have this *correct illumination* that Goodrich Stocklites soon pay for themselves.**

The Goodrich Stocklite is designed *precisely* for this purpose. It uses the lamp's full intensity without waste of light . . . illuminates shelves from top to bottom . . . eliminates harsh glare in the aisle . . . assures comfortable vision. Finished in the best quality of porcelain enamel, the Stocklite is a permanent, weatherproof fixture; easy to install. An exclusive Goodrich product.

SEND FOR THIS NEW BULLETIN

Fully illustrated with interesting photos, this new 12-page bulletin gives you all the facts about the Stocklite. If your electrical supplier doesn't have it, write us for a copy. Ask for Bulletin 91, "Light on the Subject."

GOODRICH
ELECTRIC COMPANY
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 2904 N. OAKLEY AVENUE, CHICAGO, ILL.

sions of the bays the new framing members had to be individually fitted and secured. Working space, both vertically and horizontally, was very limited; hence beams and girders had to be erected piece by piece.

Wood construction was adopted because of the ease with which it can be fabricated on the job, to exact dimensions. Use of special metal connectors in joining the members increased their strength and the ease of fabrication, so that the work was done rapidly and at a very reasonable cost.

473

Eliminates 10-Day Cure

Use of quick-hardening cement in building the foundation for a drier in the plant of Sutter Bros., Inc., Cataraugus, N. Y., eliminated the 10-day curing period that would normally be required with ordinary cement. The 15-ton drier was placed on the new foundation 48 hours after the cement was poured.

474

Exposes Bad Housekeeping

How to interest foremen in keeping their departments clean and in order was a problem in a large rubber goods plant. Solution was found in a big chart labelled "Dirtiest and Most Disorderly Department," put up in the office of the staff superintendent of one division. On this chart space is provided for the name of the foreman of the offending department. Of course, no foreman wants such dubious publicity for himself and his department. Result: No trouble in keeping the plant clean.

475

Steel Plates Cut Wear

Steel floor plates are a highly effective means of protecting all kinds of floors against damage in places where the service is particularly severe. Virtually indestructible, except under acid attack, they afford practically perfect protection to the underlying floor.

If a smooth surface is too slippery, plates can be had in various anti-slip patterns.

476

Cuts Floor Cleaning Costs

Removal of paraffine drippings from the floor of a paper container factory presented a serious problem until a floor machine equipped with crinkled scarifying brushes was put to work. The former method of removal by ice scrapers, followed by

INTERNATIONAL POWER
Does the Job Better and Saves Money

ABOVE: *The small International I-12 Tractor working in the plant of the American Seating Co., Grand Rapids, Michigan.*

BELOW: *An International PA-40 Power Unit powers this crane mounted on an International Truck in New Orleans.*

● The *quality* International Harvester builds into International Industrial Tractors and Power Units *pays dividends* to owners when this equipment goes on the job. Brilliant performance, low-cost operation and maintenance, dependability, and long life are what you can expect when International Power works for you.

International Wheel Tractors and TracTracTors (crawlers) are available in several models for gasoline and Diesel operation. International Power Units are built in eleven models, ranging up to 110 max. h.p., for gasoline, gas, and Diesel operation. International Modified Units are supplied to equipment manufacturers only, and always sold as integral parts of high-grade equipment.

Investigate International Industrial Power—the nearby International industrial dealer or Company-owned branch will give you complete information.

INTERNATIONAL HARVESTER COMPANY
(INCORPORATED)
180 North Michigan Avenue Chicago, Illinois

INTERNATIONAL Industrial Power

THOUSANDS
of quick ways to profits

See the newest and best ideas in methods to reduce the cost of power applications, whether you buy power or generate it. See them now, for they are ready. See them at the coming National Power Show. More than 270 progressive manufacturers will exhibit the newest products of their ingenuity and resources devoted to the improvement of power generation, transmission and use. See these exhibits—tomorrow's engineering on display now. Your own future is at stake.

Come and bring your associates. 40,000 engineers and executives are expected. Join them!

13th NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING..

GRAND CENTRAL PALACE · NEW YORK · DEC. 5-10, 1938

Management International Exposition Company

8554A

scrubbing, was laborious and exceedingly costly and the results were unsatisfactory.

With this machine one man can clean from 1,000 to 1,500 sq.ft. of space per hour, without injury to the wood block floor. The debris removed by the brushes is removed by a portable suction unit.

It was also found that heavier brushes were very effective in removing the drippings of liquid cement used in assembling the containers, as well as accumulations of grease and solder in the metal can division of the plant.

Savings made by use of the machine were sufficient to pay for it in a short time.

477

Paints White, Saves Light

White paint applied to a 600-ft. long assembly room meant lighting bill savings. After the paint had been applied, only a few lights had to be kept burning for daytime operation. Before that, all lights were kept on all the time, and illumination was only half of what it is now.

Protection against dirty hands and greasy equipment was insured through black dados—without affecting illumination.

478

Keeps Fire From Spreading

Use of an aluminum, light-reflective finish on wooden partitions in a woodworking plant was credited by the fire department with preventing much more extensive damage during a recent fire. Investigation showed that without the protection afforded by this paint the flames would have spread through the entire factory.

479

They Work While They Talk

A loud-speaking telephone in a stockroom eliminated the long walks that formerly were necessary to answer a call on the speaking tube. Result: Less time spent in walking, fewer and shorter interruptions, more time for productive work. When called, the men can answer back from wherever they are standing.

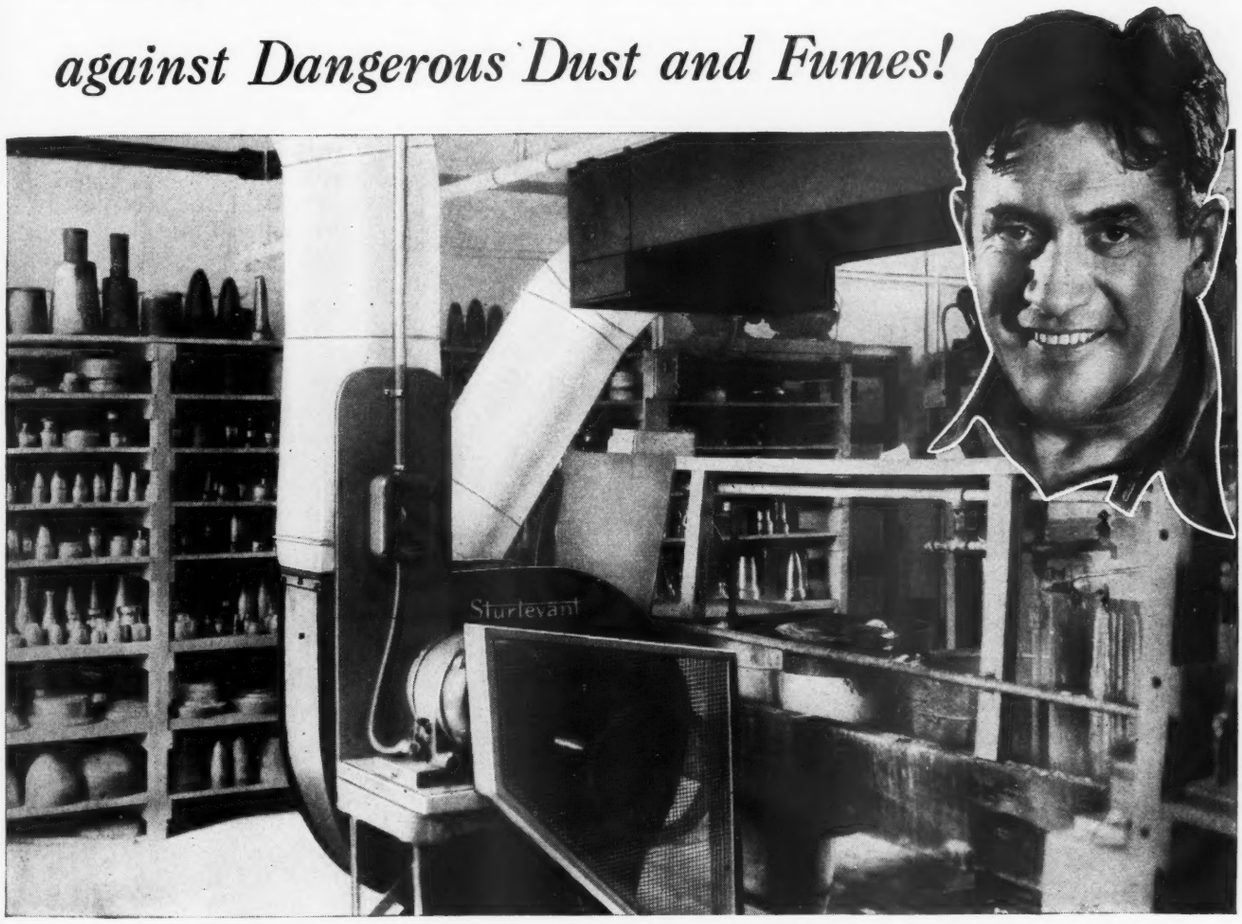
480

No Shock with Low Voltage

To prevent possible shocks to maintenance men working inside boilers and tanks, they are required in one plant to use only 6-volt lamps. Two 50-watt, 6-volt lamps are connected by heavy rubber-covered cord to a 600-watt, 110/6-volt transformer mounted

PROTECTION FOR WORKERS

against Dangerous Dust and Fumes!



Sturtevant System for exhausting ammonia and acid fumes from dipping tanks in the coloring room of L. F. Balfour Company, Attleboro, Mass.

Sturtevant Fume Removal System in plant of Aluminum Company of America, Edgewater, N. J. Used to carry off fumes from plating and other baths.

Sturtevant Grinder Exhaust System in plant of Rustless Iron & Steel Corp., Baltimore, Md. This system carries off emery and steel dust from grinding operations.

DANGEROUS dust and fumes are serious health hazards. They also often slow up workers—breed carelessness and inefficiency—create fire risks.

Let Sturtevant help you provide the most effective protection against these costly handicaps.

Sturtevant Dust and Fume Removal Systems are expertly designed—are based on over 75 years of air engineering experience. They provide not only thoroughly effective removal of dust and fumes—but also assure the advantages of low power consumption and space economy.

The Sturtevant engineer in our nearest office would be glad to discuss your problem with you and would welcome your inquiry.

Sturtevant
REG. U. S. PAT. OFF.
Puts Air to Work

B. F. STURTEVANT COMPANY
HYDE PARK, BOSTON, MASS., *Branches in 40 Cities*
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Hyde Park, Boston, Mass.
Please send information regarding Sturtevant Equipment For Removing Dust, Fumes or Vapors

We want to remove_____

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COMPANY_____

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Fans, Blowers, Air Washers, Air Conditioning, Heating, Vacuum Cleaning, Drying, Mechanical Draft Equipment

"A DeVilbiss Expert Can Help You With That Spray Problem"

Leadership is won by building products that give better service. Leadership exacts many penalties. But it also brings many benefits. One of the greatest is new business created by the praise of buyers for the products of a leader.

For many years DeVilbiss has maintained unquestioned leadership in the spray-painting field—servicing the nation's greatest but never forgetting its smallest user. When you are told that "A DeVilbiss Expert Can Help You With That Spray Problem," it is a sincere recommendation invariably based upon some actual experience.

DeVilbiss Experts know every phase of spray-painting—the production, cleaning, and regulation of air—the feeding of air and material to the spray gun—the ventilation of the painting area. These men are at your disposal. No obligation! If they can't solve your problem, they'll refer it to DeVilbiss Engineers. And they'll create for you exactly what you need. The DeVilbiss Company, 321 Phillips Avenue, Toledo, Ohio.

The most advanced type of

Spray-Painting and Finishing Equipment, Exhaust Systems, Air Compressors, Hose and Hose Connections.

DE VILBISS SPRAY SYSTEMS

1888 . FIFTY YEARS OF QUALITY PRODUCTS . 1938

on an aluminum plate which was purposely made too large to go through a boiler manhole. The transformer core and metal plate are grounded to the conduit of the plant lighting system.

481

Non-Skid, Non-Leak

Rubber floors for shower baths have a non-skid tread, can be laid with a 6-in. turn-up, making waterproof connection with wall tiles.

482

No Wear After 3 Years

Floor covering in the syrup room of a bottling company that handles a popular drink is subject to frequent scrubbing and rinsing to remove the various liquids that are continuously being spilled on it. After more than three years of service, a fiberized mastic floor covering in sheet form showed no deterioration, whereas much trouble had previously been experienced with other types of floor covering.

483

Reduces Glare from Windows

For coating windows and skylights to reduce sunlight and glare a chrome green paint made up with a perilla oil or synthetic vehicle has been found to be satisfactory and long-lived. Ordinary paints are not always suitable for this service.

In cases where materials or products may be injured by sunlight, a blue paint is preferable to green. It is necessary, of course, to use a pigment that will not fade.

484

Easier on the Air

Compressed air at 100-lb. pressure is required for certain services in one plant. A study to determine why costs were high disclosed that high-pressure air was being used for several different purposes, a number of which could be served just as well, or better, by low-pressure or fan air.

Installation of a small low-pressure compressor and a small blower to serve all applications where high-pressure air is not essential, took a large part of the load off the main compressor and cut costs considerably.

485

Foundations Done in a Day

At the Noble, Ill., plant of the Pure Oil Company it became necessary to get two pumps and engines into operation as quickly as possible.

SAVE POWER SPACE TIME!

EXECUTIVES AND CHIEF ENGINEERS in every industry are as enthusiastic about the new Vari-Pitch Speed Changer as the operators are. And no wonder! For the Vari-Pitch Speed Changer cuts costs . . . saves space . . . saves time!

Available in sizes from 1 to 33 hp, ratios up to 3¾ to 1, maximum output speed 3500 rpm, the Vari-Pitch Speed Changer is a product of Allis-Chalmers Manufacturing Company, originators of the Texrope Drive and Vari-Pitch Sheave.

Get this Triple Saving with the Sensational New Allis-Chalmers Vari-Pitch Speed Changer! Make Your Machines Bigger Money Makers! Get the Facts on this Fast-Selling Variable Transmission that Cuts Power Waste . . . Space Waste . . . Production Waste!

SAVE POWER! It's a power saver . . . this new Allis-Chalmers Vari-Pitch Speed Changer! Its efficiency has been proved in actual tests under load! Dynamically balanced Vari-Pitch sheaves . . . anti-friction bearings . . sturdy Texropes combine to save your power and maintenance dollars.

SAVE SPACE! It's a miser on space! The new Vari-Pitch Speed Changer occupies only ¼ to ⅓ the space required by bulkier transmissions. Double shaft extensions allow you to put the unit wherever you want it. There's no need for complicated, space-wasting layouts!

SAVE TIME! You get easy, quick operation. A few turns of the wheel and the speed change is made . . . without stopping your machine . . . without holding up production. If you desire it, the Vari-Pitch Speed Changer can be equipped with electrical fingertip control . . . a flick of the switch gives you *extra-fast* speed changes.

No other variable transmission on the market today gives you all these *extra* values. Get the whole story. Send for Bulletin 1266. Find out how you can save power . . . space . . . time . . . make your machines bigger money-makers with the Allis-Chalmers Vari-Pitch Speed Changer!

Vari-Pitch Speed Changers • Texrope V-Belts • Duro-Brace Texsteel Sheaves • Vari-Pitch Sheaves • Standard Cast Iron Sheaves • Adjustable Pitch Diameter Texsteel Sheaves • 2-3-4 Combination Sheaves • Straitline Automatic Motor Bases • Oil Field Drilling Rigs

Belts by Goodrich

953

TEXROPE DIVISION

ALLIS-CHALMERS

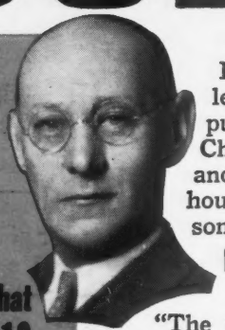
MILWAUKEE · WISCONSIN

NINE YEARS IN A DYE HOUSE!

Another true case history from the Allis-Chalmers files that proves **"IT PAYS TO BUY THE EQUIPMENT THAT PAYS FOR ITSELF!"**

THE SERVICE RECORD OF AN ALLIS-CHALMERS MOTOR AND TEXROPE DRIVE

Here's the Sensational Story of an Allis-Chalmers Motor and Texrope Drive as told by P. W. Eshelman, president, Wilkes Hosiery Mills Co. Read How This Motor Stood Up under Conditions that Wrecked Ordinary Motors in 12 Months! Learn How You Can Cut Maintenance Costs . . . with the Equipment that Pays for Itself!



If you want to learn about equipment that cuts operating costs . . . if you want to hear of motors that stand up *nine times* as long as ordinary ones . . . then read this sensational performance story that P. W. Eshelman tells about his experience with an Allis-Chalmers "Lo-Maintenance" Motor!

Mr. Eshelman is president of the Wilkes Hosiery Mills Co., North Wilkesboro, N. C. In his plant, near the ceiling of the dye house, a motor must be installed to operate a line of open paddle type machines. Operating conditions . . . moisture, heat, and fumes . . . are adverse—so adverse that ordinary motors lasted only 12 to 14 months!

Then came the "Lo-Maintenance" motor that made news!

"In June, 1929," said Mr. Eshelman, in his unsolicited letter of July 5, 1938, "we purchased a standard Allis-Chalmers vapor-proof motor and installed it in our dye house. This week we made some repairs to the building.

In Perfect Condition . . . After Nine Years!

"The motor was completely dismantled for examination and cleaning *for the first time* since it was installed! And it was in perfect condition . . . after nine years of uninterrupted service!"

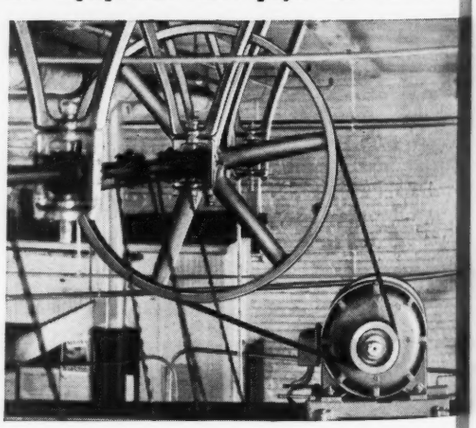
But that's not the only equipment that made news at Wilkes Hosiery Mills. At the same time the motor was purchased, a set of Allis-Chalmers Texrope Drives was installed in the dye house, where other drives lasted less than two years.

"That original set of v-belts on the Texrope Drive," wrote Mr. Eshelman, "was taken off at the same time, having completed over nine years of service without breakage or decomposition under the conditions mentioned. And our foreman believes they would have given one or two more years of service had they been left on!"

Put Allis-Chalmers To Work For You!

No wonder that Mr. Eshelman has equipped his entire plant with Allis-Chalmers Motors and Texrope Drives! No wonder that other informed executives all over the country specify Allis-Chalmers equipment. They know the service records that Allis-Chalmers equipment sets . . . the savings in production costs that it makes possible. They know it's the equipment that pays for itself!

In your plant, there's work that Allis-Chalmers can do for you. Find out about it. In the nearby Allis-Chalmers District Office is a production engineer, ready to put 90 years of engineering experience to work for you . . . with the equipment that pays for itself!



"WE DID NOT WRITE YOU," said Mr. Eshelman, "with the view of securing any publicity. We were so well pleased with the service obtained from this installation that we just felt like telling you about the excellent service your equipment gave us." The installation picture is an actual photograph of the Allis-Chalmers motor and drive in the dye house at Wilkes Hosiery Mills Co.

MOTORS FOR ALL APPLICATIONS FROM ½ HORSEPOWER AND UP

977

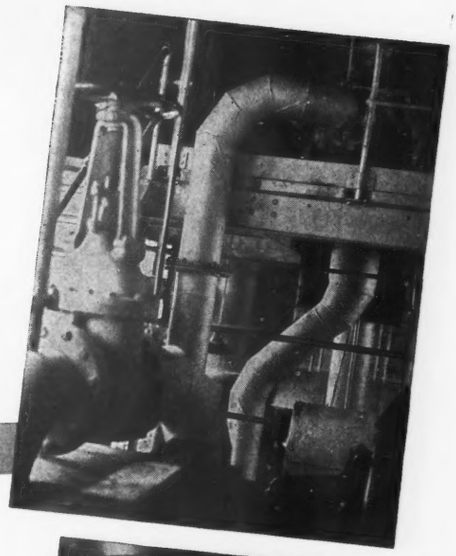
ELECTRICAL DIVISION

ALLIS-CHALMERS

MILWAUKEE · WISCONSIN

A CONVENIENT WAY TO *Cut Piping Costs*

Here is a good example of how Armco shop-fabricated piping eliminates unnecessary joints and saves space. Note tapered reducer at right.



Another "tight fit" simplified here with resulting savings in erection costs — all because Armco Spiral Welded Pipe was custom-built for the job.

Armco shop-fabrication saves up to 25% in first cost, simplifies erection, lessens chances for joint leakage.

Why continue to design piping "the hard way," when Armco can spare you all that unnecessary trouble and expense? Just mail your detailed drawings and specifications and let us fabricate the complete piping layout to fit your individual requirements.

This way you'll eliminate unnecessary joints, save time and labor in erection, and simplify future maintenance. You'll also find Armco custom-built piping much easier to support or hang than assemblies with greater weight and a greater number of joints. Even more, the "streamlined" design and smooth interior of Armco piping assure increased flow capacity, lower pumping costs.

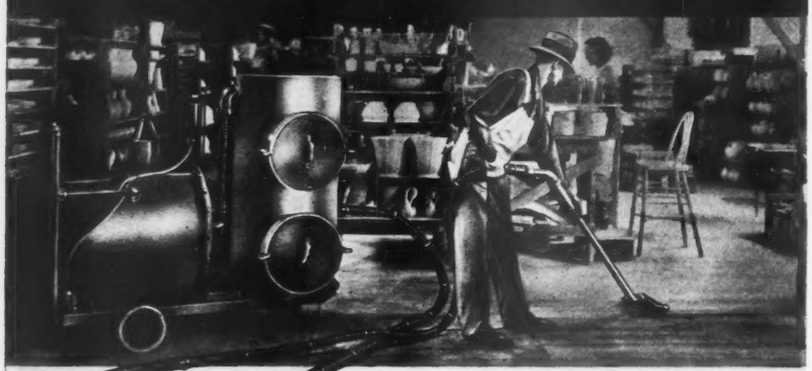
Mail your inquiry and specifications today for pipe diameters from 6 to 36 inches; wall thicknesses from 7/64 to ½-inch. Specify either ARMCO Ingot Iron or steel, with the type of coating you have found most satisfactory. The American Rolling Mill Co., Pipe Sales Division, 3491 Curtis Street, Middletown, Ohio.

ARMCO

ARMCO SPIRAL WELDED PIPE

MEMO TO ALL PLANT MEN!
500 Ways to cut Cleaning Costs:
Your Magnus Service Man has 500 practical, tested ideas on how to cut cleaning costs—Call him in—he'll show you how Magnus Cleaning Economies will show you substantial savings, and increase your profits.
MAGNUS CHEMICAL COMPANY
Manufacturers of Industrial Soaps, Cleaning Materials, Sulfonated Oils, Emulsifying Agents, and Metal Working Lubricants
220 South Avenue Garwood, N.J.
MAGNUS CLEANERS

VACUUM FOR CERAMIC INDUSTRIES



Dust in ceramic and similar industries is not only dangerous, but very expensive.
Spencer Vacuum Systems remove all kinds of dust and dirt from all kinds of surfaces and machines, quickly and at low cost.
Spencer Vacuum will enable you to keep the receiving, mixing, manufacturing and shipping rooms clean.
If you use valuable materials much of the waste material can be salvaged by vacuum.
If you now use hand cleaning methods you are cleaning your factory the most expensive way.
Our nearest representative will tell you how you can save, and how much it will cost.
SPENCER HARTFORD
CENTRAL AND PORTABLE VACUUM CLEANING SYSTEMS
123-D
THE SPENCER TURBINE COMPANY, HARTFORD, CONN.

Foundations for these two units were therefore made from a quick-hardening cement, poured in one operation.

After these foundations had stood for 24 hours, a 200-hp. natural gas engine, direct-connected to a large pipe-line pump, was mounted on each block. Each engine weighs about 13 tons, while the pumps weigh about 10 tons each.

486

Cleans Brickwork Easily

Brick walls can easily be cleaned with the aid of a compound made up in the proportion of 1 lb. powdered pumice to ½ gal. soft soap and ½ pt. ammonia. Stir the mixture thoroughly, apply with a brush, and allow to stand for 20 or 30 min. Then rub it into the brickwork with a stiff brush, and rinse off thoroughly with a hose.

487

When Not to Patch Roofs

As a general rule, when built-up roofs that are more than 15 years old begin to leak and require frequent patching, money can be saved in the long run by replacing them.

488

Not a Slip in a Shower

Cost of one accident caused by slipping in a shower may more than pay for the anti-slip floor that should always be used in such places.

PRODUCTION PLANNING AND CONTROL

(CONTINUED FROM PAGE 110)

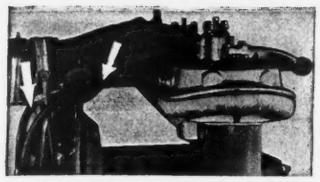
separately. Piling strips 1⅛ in. square are inserted every 2 ft. Piles are well covered. This company claims practically no loss in air drying and at least a 10 per cent saving over former slipshod piling methods.

489

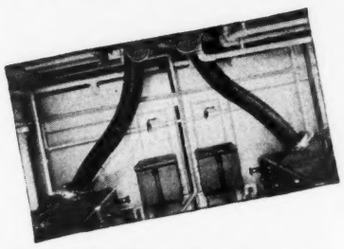
Duplicating Saves $2,000

A stencil-type duplicator was formerly used at the Norwich Knitting Mills, Norwich, N. Y., for general duplicating work. Coupon tickets were printed in the quantities required for each mill lot.

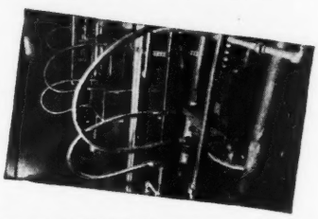
Installation of a duplicating machine was followed by a marked reduction in the cost of such work. For example, approximately $2,000 a year is being saved through the elimination of printing costs for coupon



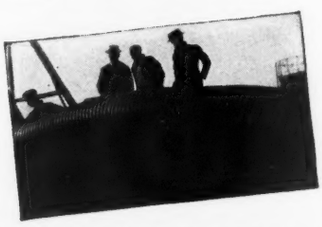
Flexible METAL Tube steam connections are a leading feature of this garment pressing machine . . . find wide application in many other fields.



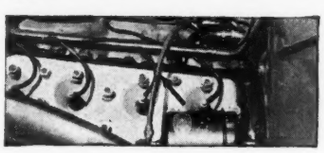
These Flexible METAL Diesel exhaust connections are fume-tight, resistant to high temperatures and exhaust gases, flexible to absorb vibration, reduce maintenance.



Flexible METAL Tube steam and cold water connections prevent steam losses and production delays, reduce maintenance on platen presses.



Two lengths of 12" Flexible METAL Hose serve as temporary city gas mains during installation of new permanent mains. Industry will find economy and convenience in many similar uses for Flexible METAL Hose and Tubing.



Typical Installation of Flexible METAL Tube gasoline feed line on modern automobile motors and on industrial gasoline engine units.

When YOU THINK OF SAFETY YOU THINK OF METAL....

Massive oak doors once served to guard treasure vaults, but modern banks put their faith in steel. Similarly, in almost every field of industry, engineers seeking greater safety, known strength, predetermined ability to meet hard service demands, find a sure answer to their problems in metal.

The development of Flexible METAL Hose and Tubing is an outstanding example of this natural trend. Only correct METAL construction can be expected to meet many of the conditions of high temperature, high pressure or mechanical strain under which flexible connections must function in industry. In all such applications Flexible Metal Hose and Tubing possesses important advantages leading to economies.

Just why this is true . . . and how Flexible METAL Hose and Tubing can contribute to the betterment of the equipment you make or operate is fully explained in the informative new "Fact Book" just published by this Institute. We shall be glad to send you a copy free . . on request.

Specify FLEXIBLE METAL HOSE *and* TUBING

FLEXIBLE METAL HOSE AND TUBING

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CERTIFIED

. . . to cost you less per unit produced

Yes! . . . less per unit produced than *any* other belt under identical conditions. Such is the certification accompanying each VIM TRED Leather Belt shipped from our factories or warehouses. Made from highest quality imported hides and tanned by the exclusive VIM mineral process, these belts represent the acme in power transmission.

To you this means lowered production costs . . . less maintenance . . . higher efficiency . . . increased profit! Write today for full information!

E. F. HOUGHTON & CO.

Chicago – PHILADELPHIA – Detroit

VIM TRED
LEATHER BELTING

tickets. Both time and labor are saved in handling short-run work, and the cost of making stencils has been cut out.

490

Wastes Reduced by $5,500

Because inspectors make daily contacts with the various production departments, they are in position to make valuable suggestions for waste reduction. At Goodrich, for instance, when a matting mold was in the shop having changes made, they were able to work out a reduction in size of rind cavity which brought a savings of $500 a year. In another department, an inspection suggested a different shape of preparation. Result was a reduction in cured trim or rind amounting to $5,000.

491

Tool Handling Down $9,000

A. O. Smith Corporation, Milwaukee, made an analysis of its tool crib service to determine whether tool costs might be cut by replacing their brass checks by a modern system of tool control. This control was therefore installed in one crib. The savings may be summarized as follows:

1. The inventory of tools in the crib was reduced approximately $9,000 as a result of proper records.

2. The breakage of tools was reduced from $90 to $40 per month. It was made apparent that a small number of employees were responsible for most of the breakage. This condition quickly improved.

3. Under the old system tools worth a considerable sum were "lost, strayed, or stolen" each year. This has been totally eliminated.

4. Inspection of returned tools prevents the accumulation of damaged and dull tools, with resultant reduction in rejected parts.

5. Four tool crib transactions were handled under the new system to one under the old.

6. Attitude of workmen and crib attendants was investigated, with the conclusion that both would object to reverting to the old method.

The economies affected in this one crib demonstrated that the method should be made standard throughout the plant.

492

Run on 8 Pieces of Paper

A 200-man furniture plant finds eight pieces of paper plenty to control production. They include (1)

ULTRA MODERN BUILDINGS *Deserve* ULTRA MODERN HEATING

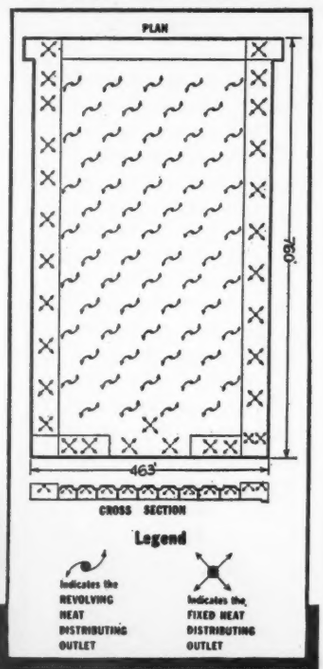
99 Wing *Featherweight* UNIT HEATERS

delivering over 34,000,000 B.T.U. per hour, heat the fine new Delco Appliance plant, division of General Motors Corporation, designed by Albert Kahn, Inc.

The building is the last word in modern manufacturing plant design and construction.

63 heaters in the manufacturing section, which are of our latest type having revolving heat distributing outlets, were selected because they deliver live, invigorating, constantly circulating heated air. The heaters in other sections are of the same type but with fixed distributing outlets. Many other modern buildings, both single story and multi-story, are equipped with WING Featherweight Heaters.

Possibly you would care to have our convenient Heating Maintenance Chart? It is FREE and most helpful.

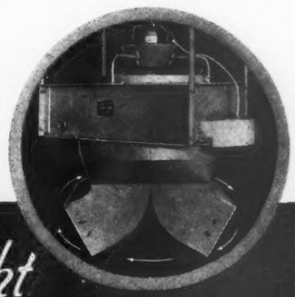


Our Engineers will gladly go into detail with you concerning WING Featherweight Unit Heaters for your buildings.

L. J. Wing Mfg. Co.

(The Pioneer of Ceiling-Suspended and Lightweight Unit Heaters)

162 W. 14th ST. NEW YORK, N. Y.



Wing Featherweight UNIT HEATERS *Floodlights of Heat*

DISCOVERED

A NEW WAY To Cut Costs

You would be amazed at the number of manufacturing plants in this country using Delta Drill Presses that list under $50! Their names read like the Blue Book of American Industry. Other Delta tools at corresponding low prices are doing things in both metal and woodworking that were previously thought impossible. Just consider these factors: *Low first cost*—because Delta light power tools are made in quantities on the finest high-production equipment; *Economical operation*—because they are lighter and require less power; *Low maintenance cost*—because of sealed-for-life bearings and the low cost replacement parts; *Flexibility*—special units can be made up from Delta tools at a considerable saving; *Portability*—Delta tools can be moved instantly where they are most needed; *Reduced labor cost* — because they can be used for auxiliary operations to fill in "waiting time" that would be otherwise wasted.

If you want to learn how to cut your production costs without a heavy investment—if you want to learn how other manufacturers, large and small, are stealing a march on their competitors by using light power tools—send for the 1939 Delta Catalog TODAY! It will give you facts, figures, specifications and performance records that will open up your eyes!

DELTA

MANUFACTURING COMPANY

611 E. VIENNA AVENUE, MILWAUKEE, WISCONSIN

routing card, (2) time slip for employees on daywork, (3) machine record, (4) machine breakage form, (5) operation card, (6) time card for finishing room operators who are on piecework, (7) inspection report, (8) foreman's record.

493

Body Meets Chassis Right On the Dot

In mass production, the teletypewriter provides effective control of final assembly operations—as, for instance, at General Motors Truck & Coach Division, Pontiac, Mich. When a body is completed, the order goes by teletype to subassembly groups, the frame is laid down, and chassis assembly is started.

Meanwhile the body is moving toward the assembly line. Just as it comes up through the hatch to the assembly floor, it meets the chassis for which it was intended.

494

Pay Them What They're Worth

Jim Jones, 10 years on the job and an asset to any organization, certainly ought to get more money than Jack Smith who came to work a few weeks ago and is just another fast worker. But if wages are based on output, he won't. Yet from the standpoint of good labor relations it is important to maintain such differentials. Our concern does it by rating employees as to skill and all-round worth, pays them accordingly, gets more output, and —equally important—better quality.

495

Their Plans Work Backward

Production planning in one plant begins at the shipping door and works backward. From the customer's order, the shipping schedule is drawn up. As parts are shipped, copy of the bill of lading is returned to the planning department where quantity shipped is entered on the shipping schedule, thus revealing the balance yet remaining on order and on schedule.

496

5 Places to Look for Waste

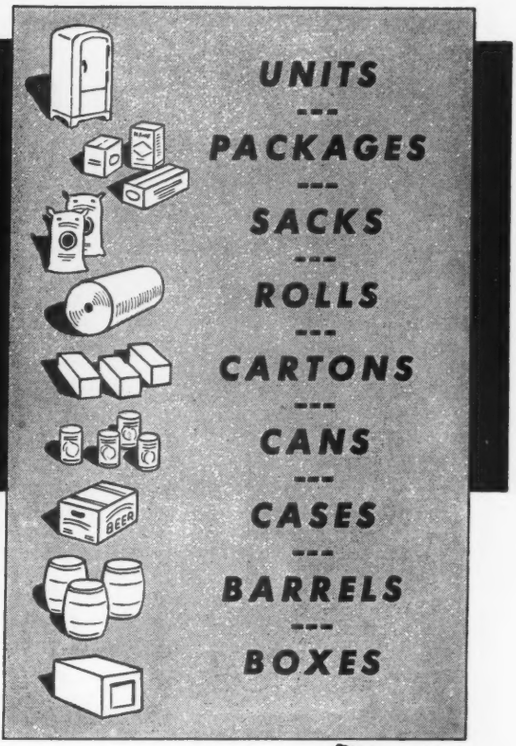
This is the way one concern groups causes of waste—in the order of their importance:

1. Design of product.
2. Carelessness and ignorance of values of materials.
3. Faulty planning.

WHATEVER YOUR

PACKAGE CONVEYING REQUIREMENT

...CALL A STANDARD CONVEYOR ENGINEER



Save Time and Money

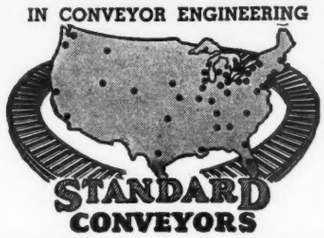
on any kind and size of package conveying job—large or small—get full facts on equipment from a Standard Conveyor Engineer—first! Their expert counsel, reflecting over thirty years of conveyor engineering experience, can save you time and money in choosing the right type of equipment to hold handling costs to the minimum on any type of product or material—regardless of shape, size or composition.

Send for "Conveyors by Standard" — a valuable reference book on handling methods.

STANDARD CONVEYOR COMPANY.

General Offices: North St. Paul, Minn.

A NATION-WIDE SERVICE IN CONVEYOR ENGINEERING



You will find Standard Conveyor Engineers in each of the following cities:

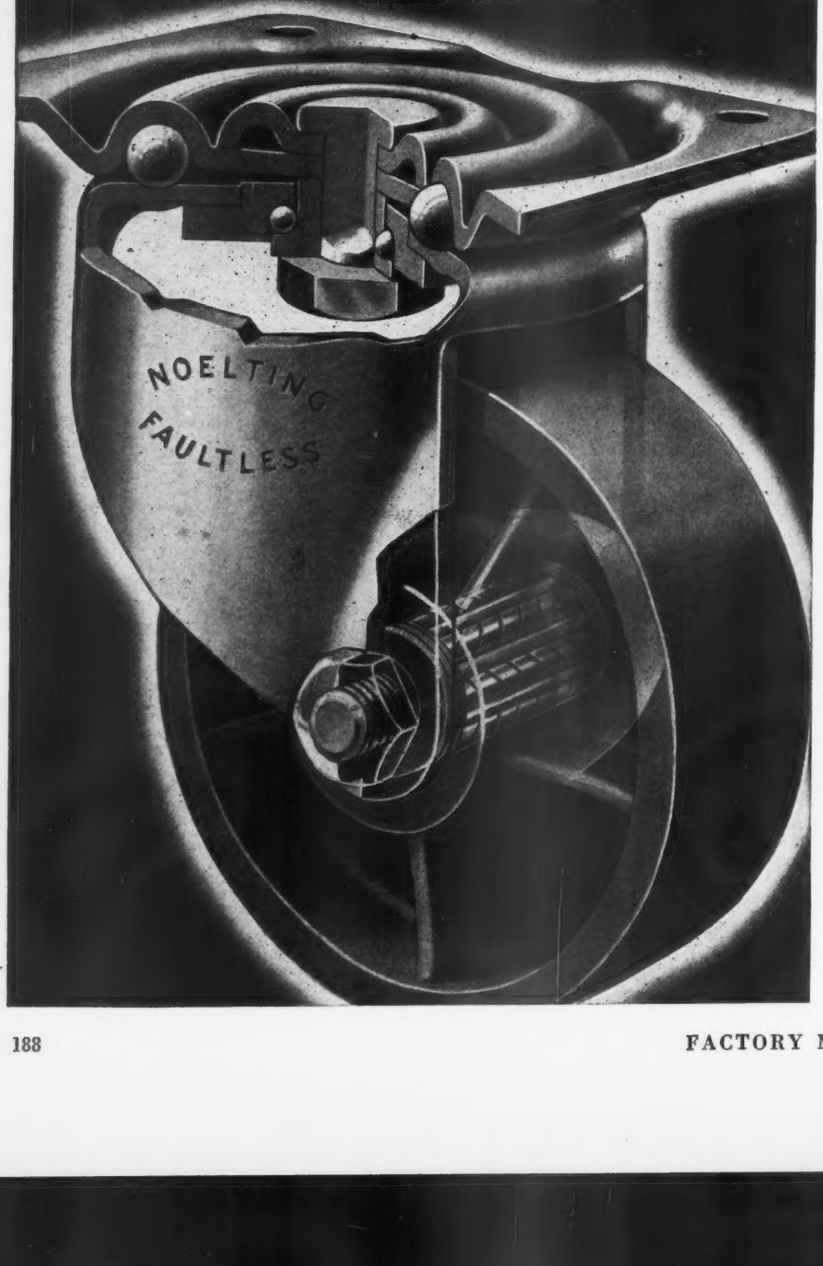
Atlanta, Ga.; Baltimore, Md.; Birmingham, Ala.; Boston, Mass.; Bridgeport, Conn.; Buffalo, N. Y.; Butte, Mont.; Charlotte, N. C.; Chattanooga, Tenn.; Chicago, Ill. Cincinnati, Ohio; Cleveland, Ohio; Corning, N. Y.; Dallas, Tex.; Denver, Colo.; Detroit, Mich.; Erie, Pa.; Evansville, Ind.; Grand Rapids, Mich.; Indianapolis, Ind.; Jacksonville, Fla.; Kansas City, Mo.; Los Angeles, Cal.; Memphis, Tenn.; Milwaukee, Wis.; Nashville, Tenn.; Newark, N. J.; New Orleans, La.; New York City; Oklahoma City, Okla.; Omaha, Neb.; Orlando, Fla.; Peoria, Ill.; Philadelphia, Pa.; Pittsburgh, Pa.; Portland, Ore.; Sheboygan, Wis.; St. Louis, Mo.; Salt Lake City, Utah; San Antonio, Tex.; San Francisco, Cal.; Seattle, Wash.; Toledo, Ohio.

Today's operating profit more than ever depends on *EFFICIENCY!*

With shortened hours for men and machines, operations of all kinds must reach new peaks of efficiency. In no place is modernization of equipment more necessary than on moving assembly and production lines. Breakdowns and delays cannot *and need not* be tolerated. Simply revamp and replace with Faultless Casters such as No. 200 Heavy Duty Truck Caster illustrated. Double ball-bearing swivel, Hyatt roller bearing, semi-steel wheel. Frictionless, exceptionally strong and durable. Sold by leading distributors everywhere.

FAULTLESS CASTER CORPORATION, Dept. FM-7, Evansville, Ind.
Branches in Principal Cities • Canadian Factory: Stratford, Ontario

FAULTLESS CASTERS
FOR INDUSTRY



4. Design of manufacturing and handling equipment.

5. Conditions of materials as purchased from the vendors.

497

Spent $200, Saved $3,395

Splitting machine in the Mechanical Goods Division of the B. F. Goodrich Company was originally designed to handle stocks up to 38 in. wide. It was remodeled at a cost of $200 to accommodate stocks up to 44 in. With this change, calendered width of stock was increased and resulted in savings on three separate items amounting to $2,000, $1,000, and $395 a year.

498

Keeping Good and Bad Apart

After repairing or setting an automatic machine, the work coming off must be watched for a time to check the accuracy of the adjustments. If an ordinary box or pan is placed beneath the chute and the machine suddenly begins to turn out defective parts, they will be mixed up with the good work in the box, and a good deal of time may be required to separate them.

A box with sheet-metal partitions will avoid mixing up good and defective parts that roll or slide easily. As each compartment becomes full, the parts overflow into the next one. Thus defective work may easily be isolated.

499

Controlling 27,000 Items

Stock was formerly kept in cake pans in a certain production stockroom at International Business Machines Corporation. Compare that method with the present one. Stock is now stored in adjustable steel bins. Numbering system enables stock-pickers to locate any one of 27,000 items within 6 inches. The new system was installed without interrupting production.

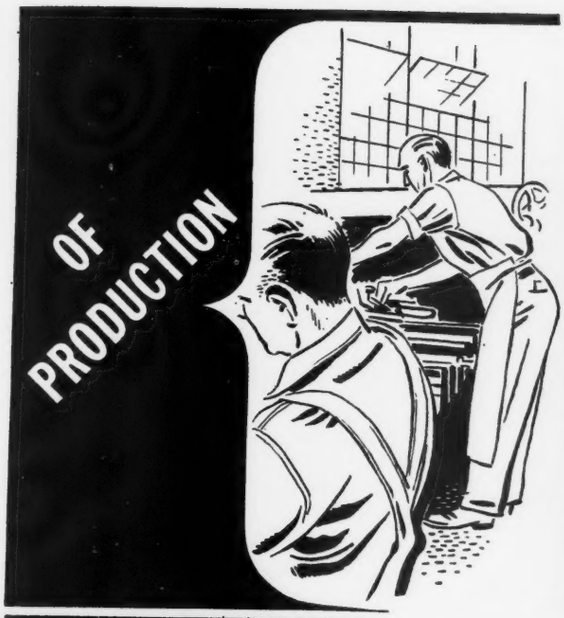
500

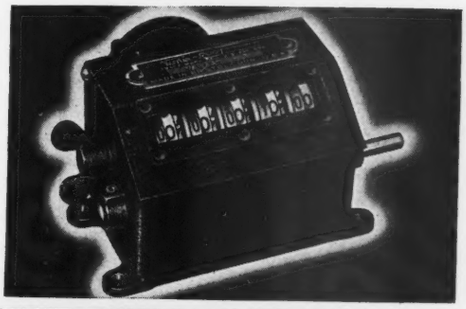
One-Man Control Tells All

What presses are idle and why. A chart kept in the blanking room at North & Judd Manufacturing Company, New Britain, Conn., shows what's happening on each of 17 presses for every hour of every day of the week. Symbols show press idle, job running, job stopped, waiting for material, job completed, and so on.

★ ★ ★

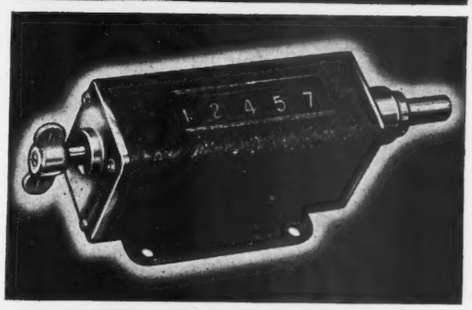
CLOSER CONTROL





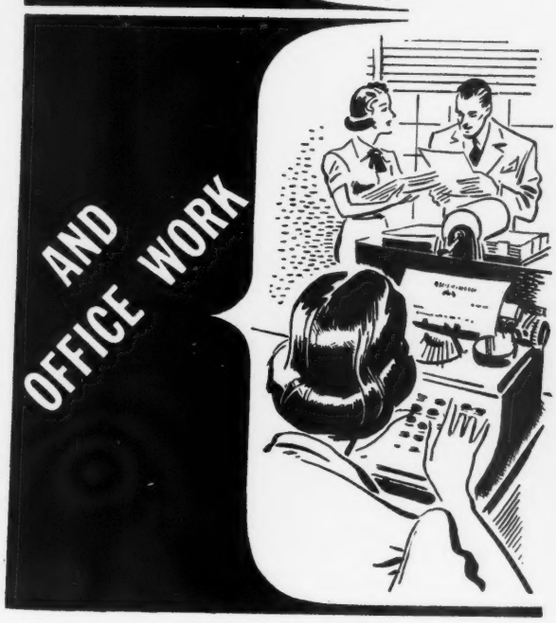
Controls High Speed Runs

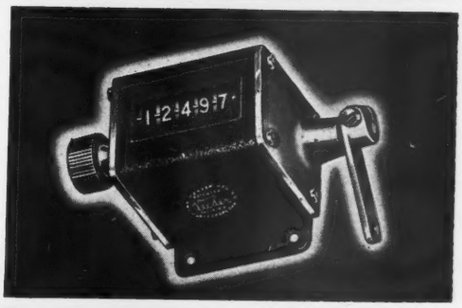
This Predetermining Counter prevents overruns and shortages on winders, fast automatics, etc., running up to 2500 r.p.m. Shuts down machine exactly when desired. Counts in any unit. Turn of knob resets to zero.



For Coil Winding and High Speed Work

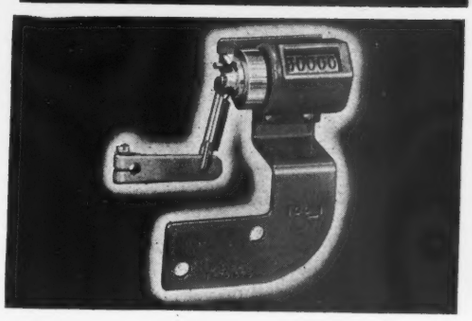
This High Speed Resetting Counter operates at 8,000 counts per minute in direct-drive type . . . 2,000 counts per minute in revolution type. Subtracts in opposite direction. Turn of knob resets to zero.





For Office and Light Production Machines

Small Reset Counters count strokes or revolutions. May be furnished with totalizing register if desired.



Records Production of Accounting and Typewritten Work

This Production Computator records each keystroke on typewriters and accounting machines, showing one figure for each 10, 100 or 240 strokes. Provides accurate basis of wage-payment and bonus systems. Made for all standard typewriters, bookkeeping and billing machines. Easily attached, no drilling.

WITH Veeder-ROOT COUNTING DEVICES

Production control can often be tightened up with the help of records provided by Veeder-Root Counting Devices. These records help to curb costs . . . to regulate work-schedules more evenly . . . to keep a closer check on maintenance needs. And you can get these records weekly, daily, hourly . . . in terms of revolutions, operations, pieces, strokes, speeds, volumes, lengths, trips, or in any other terms you want.

Office work, too, can be helped to higher efficiency and lower costs by Veeder-Root Counters on typewriters, duplicating, tabulating, check-writing and business machines of every type. In fact, there are Veeder-Root Counters for every machine and purpose . . . for mechanical, electrical and manual operation. *Write for Catalog G-37. See the Veeder-Root exhibit in Booth 325 at the Power Show, New York, December 5-10.*

VEEDER-ROOT INCORPORATED, HARTFORD, CONNECTICUT

Offices in
Boston, Chicago, Cincinnati, Cleveland, Detroit, Greenville, S. C., Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco, Montreal, Canada, Buenos Aires, Mexico City, London, Paris, Tokio, Shanghai, Melbourne

NEOPRENE GLOVES LAST 4 TIMES LONGER!

IF you want to save money on work gloves (and who doesn't?) maybe you can profit by this experience of a leading cable manufacturer . . .

This manufacturer needed durable, yet inexpensive, gloves for the operator of a hot copper wire drawing machine. Ordinary canvas gloves lasted only a day. And, because of lubricating grease on the wire, leather gloves or canvas gloves coated with rubber soon went to pieces.

However, this manufacturer found the answer to his problem in canvas gloves impregnated with Du Pont *neoprene*. Neoprene is Du Pont chloroprene rubber. It resembles natural rubber in strength, elasticity and toughness . . . but it is far less affected by oils, gasoline, acids, sunlight, ozone and aging. These neoprene gloves now last through four and even five days of gruelling service. And, in addition, the palms don't get slippery.

Ask your supplier to show you samples of neoprene work gloves. Look for neoprene parts in the equipment you buy. That's your assurance of top quality, long service, and maximum economy. For more information about this remarkable material, write for your copy of the interesting, illustrated "Neoprene Handbook." No charge or obligation.

DU PONT NEOPRENE

E. I. DU PONT DE NEMOURS & CO., INC.

RUBBER CHEMICALS DIVISION, WILMINGTON, DELAWARE

SOLVED!

The problem of safe lubrication of ball and roller bearings, avoiding the twin dangers of *under*-lubrication and *over*-lubrication

KEYSTONE BB FITTING

LOW PRESSURE LUBRICATION OF BALL AND ROLLER BEARINGS

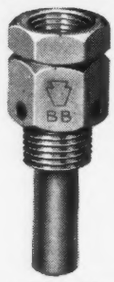
Reissue Pat. No. 20743
Other Patents Pending
ACTUAL SIZE

Makes the bearing say "When!"

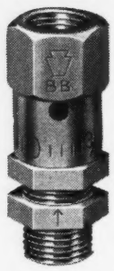
MODELS FOR ALL REQUIREMENTS

Standard hexagonal for attachment direct to bearing housing

Standard round for close clearances



Special BB Nipple Fitting for "inaccessible" bearings, for use with 2", 4", 6", 8", 10" and 12" pipe nipples



BB Adjustable Fitting to be used on any or all pipe nipples from 1" to 12"

Keystone BB Fittings are available in ¼" and ⅛" pipe thread sizes. Thousands already in use. Write for full details!

THE KEYSTONE LUBRICATING COMPANY

21st & Lippincott Streets, Philadelphia, Pa. • Established 1884

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The Ideal

FIRST AID

FOR MINOR BURNS, SCALDS, CUTS, BRUISES, METALLIC ITCH, MUSCULAR ACHES AND PAINS

The well-known Oil-of-Salt—used in and approved by over 50,000 industrial plants. Letters from many of these concerns indicate Oil-of-Salt saves "man time" and lowers liability insurance costs.

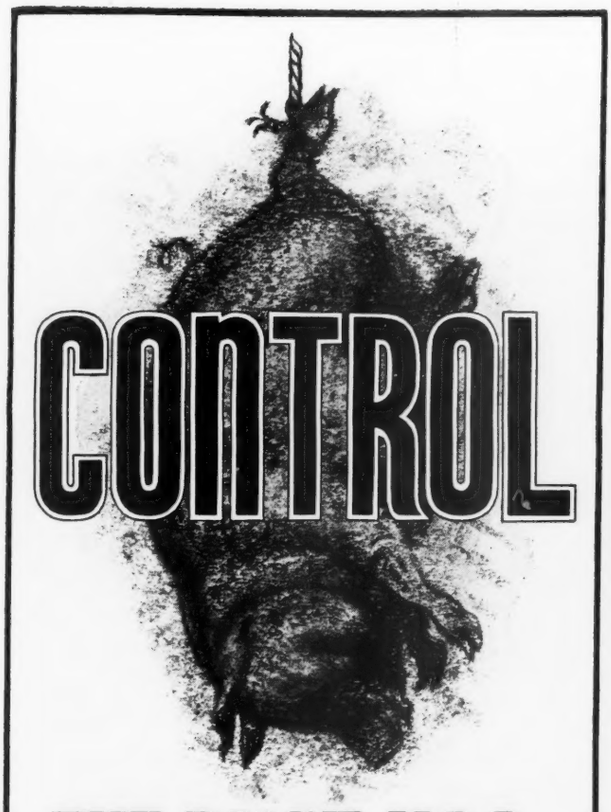
Oil-of-Salt does not destroy tissue like harsh antiseptics; is highly analgesic, soothing, non-poisonous. Prices delivered:

Pints	$3.50 each	Half Gallons	10.00 each
Quarts	6.50 each	Gallons	19.50 each

Buy Oil-of-Salt from wholesale drug or first-aid supply houses, or we will ship you direct on billing stating "if Oil-of-Salt does not give complete satisfaction we will refund the purchase price."

C. A. MOSSO LABORATORIES, 215 S. Leavitt, CHICAGO

SOOTHING Oil OF Salt



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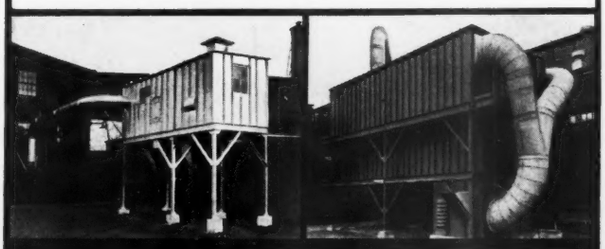
THE DUST HOG—
TURN HIM INTO PROFIT

●A double Saving is yours when you control Dust with Pangborn Dust Collectors.

First, the Saving from damages which the Dust Hog always brings—and second, the Saving arising from the salvaging of valuable materials.

More than 4400 Pangborn Dust Collectors are controlling dust today; efficiently, safely, and economically. Pangborn engineers can do a good job for you, too. Whether your problem is big or small—it will pay you to "come to Pangborn". Write today.



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THE WORLD'S LARGEST MANUFACTURER OF DUST CONTROL AND BLAST CLEANING EQUIPMENT

PANGBORN CORPORATION · HAGERSTOWN, MD.

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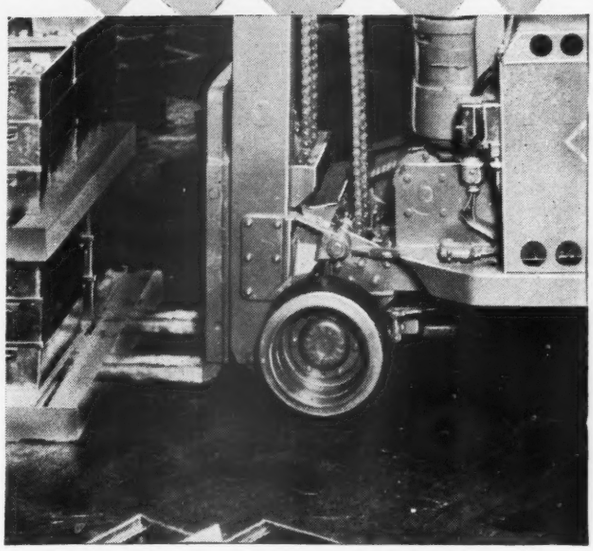
NO PROBLEM
FOR NEOPRENE TRUCK TIRE



New, resilient, easy-riding tire gives 30% more wear than rubber!

IF oily or greasy floors have meant too frequent and costly truck tire replacements in your plant . . . a leading tire manufacturer (name on request) has good news for you.

This tire manufacturer . . . in search of a suitable material for an improved, easy-riding tire for oily, greasy floors . . . found the answer in Du Pont *neoprene*. Neoprene (chloroprene rubber) tires, he proved by exhaustive tests, have the elasticity, strength, and abrasion resistance of natural rubber . . . yet they last approximately 30% longer when exposed to oil and grease. In addition, neoprene tires resist gasoline, heat, sunlight, ozone, and aging.

So now, with neoprene tires, you can cushion the load on trucks operating under severe service conditions just as easily as on trucks used in ordinary service. Be sure to ask your supplier for neoprene industrial truck tires . . . and for neoprene parts in other equipment you buy. For neoprene resilient parts are your assurance of top quality, long service, and maximum economy. Write for your copy of the interesting, illustrated "Neoprene Handbook," which will give you more helpful information about this remarkable material. No charge or obligation.

DU PONT **NEOPRENE**

E. I. DU PONT DE NEMOURS & CO., INC.

RUBBER CHEMICALS DIVISION, WILMINGTON, DELAWARE

HERE'S PROOF

(1) Neoprene-jacketed lamp cord after a year of actual use.

• • •

(2) Rubber-jacketed lamp cord after only 6 months use. Both photos unretouched.

See how shop test proves economy of neoprene lamp cable

IF YOU'RE in the market for better portable cable at lower maintenance cost (and who isn't?) you can profit by this experience of a city street railway company . . .

The superintendent of this street railway, intent on cutting upkeep costs, decided among other things that lamp cord in the shops needed replacing too often. Oil and grease were rotting the familiar cotton covering they were using.

Experimenting with other covering materials, he found that high grade rubber jacketing was an improvement over the cotton. But when this rubber jacketing was, in turn, tested against jacketing of Du Pont *neoprene* . . . neoprene won in a walk. Because while neoprene, Du Pont's remarkable chloroprene rubber, has the strength, elasticity and toughness of natural rubber . . . it is far less affected by oils, gasoline, sunlight, ozone and air.

Neoprene covered lamp cord is now standard throughout this street railway shop. Repair and replacement costs have gone down. And the superintendent's stock, you may be sure, has gone up.

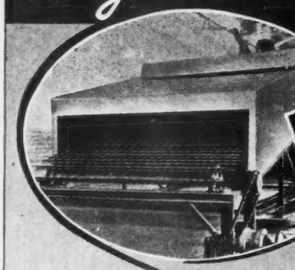
Take the hint. Specify neoprene covering next time you buy portable cable. Look for neoprene parts in other equipment you buy. That's your assurance of top quality, long service, and lowest maintenance cost.

DU PONT **NEOPRENE**

E. I. DU PONT DE NEMOURS & CO., INC.

RUBBER CHEMICALS DIVISION, WILMINGTON, DELAWARE

Ways to Save On Your DRYING



AT TEMPERATURES FROM

0° to 1000°

FAHRENHEIT

Let Ross design your equipment! You profit in the saving of TIME—SPACE—FUEL.

A fund of engineering knowledge is available to assist you in providing definite economies and production advantages with Ross equipment.

WRITE FOR DESCRIPTIVE BULLETINS

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For your protection . . . this tape undergoes searching tests for dielectric properties . . . adhesion . . . reliability. It forms readily into a solid mass, under normal finger heat. A first-class tape for a first-class job.

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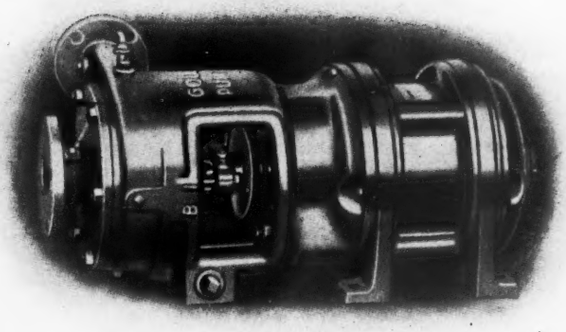


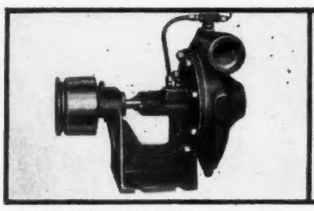
...WHERE SPACE COUNTS CHOOSE GOULDS "CLOSE-CUPLD"

Goulds Fig. 3620 "Close-Cupld" Centrifugal Pump finds wide application for general service, particularly where compactness and light weight are important.

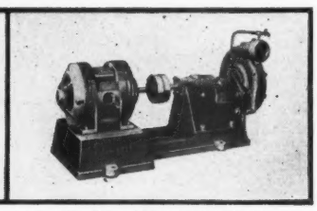
Besides featuring extreme compactness, this durable, efficient, all-purpose pumping unit is easy to install and will operate in any position. It has a broad field of use in all industries.

Simple design, careful workmanship and parts of extra strength insure low operating cost and long trouble-free life under the most exacting conditions.

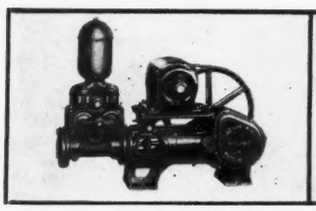
Furnished in standard and special constructions for handling ordinary and corrosive liquids, twenty-one sizes with capacities from 5 to 1600 gallons per minute, for heads up to 525 feet. Write today for Goulds Industrial Catalog.



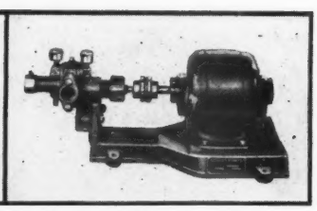
Goulds Fig. 3610-1½A Single Stage Ball Bearing Centrifugal Pump for wide range application in industry, for farm irrigation and general service.



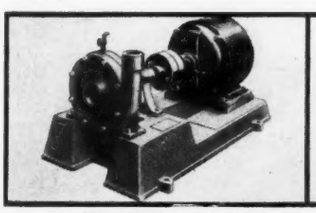
Goulds Fig. 3158 Flexi-Unit Pump. A heavy, dependable line. Built for low or high heads up to 280 feet. Capacities to 1,000 G.P.M.



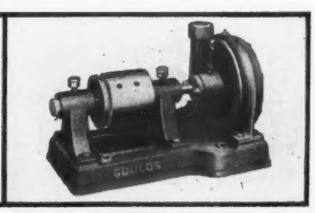
Goulds Fig. 1813 Horizontal Double-Acting Piston Pump for reliable, inexpensive heavy duty service on industrial water systems, mine pumping, etc.



Goulds Fig. 1845 Rotary Pump for direct connected motor drive, fitted to handle liquids possessing inherent lubricating qualities.



Goulds Fig. 3012 is an efficient, self-contained pump for handling Bleach and other liquids. Maximum capacity 25 gal. per minute.



Goulds Fig. 3010 Belt-Driven Centrifugal Pump for general service. Low priced, sturdy construction and extremely efficient.

GOULDS PUMPS Inc.

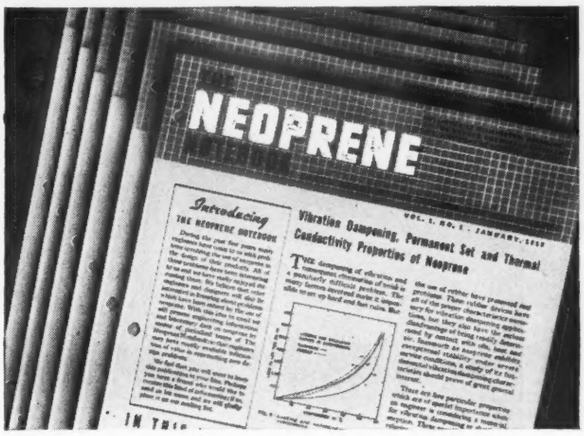
SENECA FALLS, N.Y.

ATLANTA, BOSTON, CHICAGO, HOUSTON, NEW YORK, PHILADELPHIA, PITTSBURGH, TULSA. Representatives in all Principal Cities

8408

THE PROBLEM YOU FACE TODAY

someone else may have solved yesterday!



New free monthly bulletins show you how others are using neoprene to solve their problems

IF you're an engineer, a designer, or a manufacturing executive, you'll be interested in *neoprene*. Neoprene is the remarkable new material which looks like rubber . . . but which does a good many things rubber can't do.

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Wilmington, Delaware

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Where rust climbs to inaccessible spots, where painting and inspection are difficult, where iron and steel are constantly exposed to wind and weather, and where failure due to rust may mean death to pedestrians . . . there Hot Dip Galvanizing demonstrates conclusively that it is the longest wearing, lowest cost protection known to modern science . . . Several state laws specifically read that all steel work on overhanging signs and billboards be galvanized . . . On structural supports, chains, bolts, nuts and strap fastenings, Hot Dip Galvanizing done by members of this association assures a thick layer of molten zinc which penetrates the surface and becomes an actual part of the product, giving a complete coverage of crevices and corners and guaranteeing perfect workmanship in every respect. Write for our literature. American Hot Dip Galvanizers Association Incorporated, American Bank Building, Pittsburgh, Pa.

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Thomas Gregory Galvanizing Works, Maspeth, N. Y.
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Joslyn Co. of California, Los Angeles, Cal.
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Lehigh Structural Steel Co., Allentown, Pa.
Missouri Rolling Mill Corp., St. Louis, Mo.
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"Jackman, the Research Belting salesman, said we'd get at least 1 or 2% more average machine production with Research Leather Belting over ordinary belting . . . or we could have our money back.

"Well, here are the figures . . . and they're up 3¼%! Translate that percentage into dollars, and you've got something. With an extra profit like that, we'd be crazy not to put Research Belting on all our drives."

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You or your purchasing manager will find the nearest sales office or distributor listed in the Graton & Knight insert in the belting section of Thomas' Register. Why not call today to get Research Belting on one of your important drives where increased production can be measured?

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MODERN GROUP DRIVE

Graton and Knight

RESEARCH BELTING

from the Home of Research, Worcester, Mass.

WRITE FOR OUR HANDBOOK ON LEATHER BELTING AND POWER TRANSMISSION

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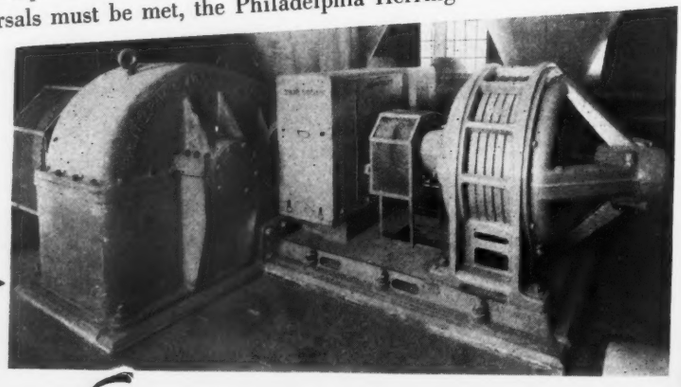
Is your POWER TRANSMISSION EQUIPMENT as obsolete as this wood-burning "El" of the '80's

In many industrial plants the devices used for transmitting power have not been kept abreast with the adoption of the newer developments in production machinery. A check-up in *your* shop may show the need for modern Philadelphia Speed Reducing Units. Available, as they are, in every possible type, there's not a drive in your set-up that cannot be efficiently, economically and safely transmitted through Philadelphia Units. For example, on heavy duty work, where resistance to shock or frequent reversals must be met, the Philadelphia Herringbone Reducer acknowledges no equal. The photograph at the right shows a typical installation. Why not let our engineers discuss your requirements with you. Their impartial recommendations may save you real money.



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This Philadelphia Herringbone Unit operates a heavy conveyor. In its sturdy housing are the alloy steel gears with teeth that have been cut to split-hair accuracy. Bronze and roller bearings on the shafts assure long smooth running.

PHILADELPHIA

HERRINGBONE
Speed Reducers

PHILADELPHIA GEAR WORKS
Industrial Gears and Speed Reducers
ERIE AVENUE AND G STREET, PHILADELPHIA, PA.

99 9,996,551/10,000,000% OF CRANE SCREWED FITTINGS ARE FOUND FIT*

THE precise manufacturing methods that account for such a high standard of perfection in the production of Crane Screwed fittings are your assurance of superior performance—even in Crane fittings for the most common services. For greater piping satisfaction, specify Crane-Equipment throughout, because—in fittings as in valves—

IT'S WHAT'S INSIDE THAT COUNTS!

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VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS

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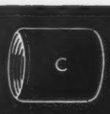
CRANE SCREWED FITTINGS FOR POWER PLANTS AND FACTORIES

Crane's line of fittings includes not merely the few hundred types and sizes in most common use, but a total of more than 10,000 separate and distinct items in cast and malleable iron.

ELBOWS—90°, 67½°, 60°, 45°, 30°, 22½°, 11¼°, and 5⅝°, Street, Long Sweep, Side Outlet, Drop, Hub Vent

TEES—Service, Four-Way, Drop Tees, Long Sweep, Double Sweep, Wash Tray



COUPLINGS—Right Hand, Right and Left, Half (Also Wrought Iron), Reducers, Increasers

UNION FITTINGS—Male and Female, 90° and 45° Elbows, Tees with Union on Run or Outlet

BUSHINGS—Outside and Inside Hexagon, Face, Eccentric, Double Tapped

PLUGS—Square Head, Solid, Countersunk, Bar, Barrel

NIPPLES—Close, Short, Long, Tank

UNIONS—Ground Joint, Gasket-Type, Female, Male and Female, Air-Pump

A CRANE FITTING FOR EVERY PURPOSE—The screwed fittings shown above are only a few of the scores of different types and modifications. The complete Crane line includes banded and plain patterns, black or galvanized, in a wide range of straight and reducing sizes, in four pressure classes in malleable iron and five in cast iron.

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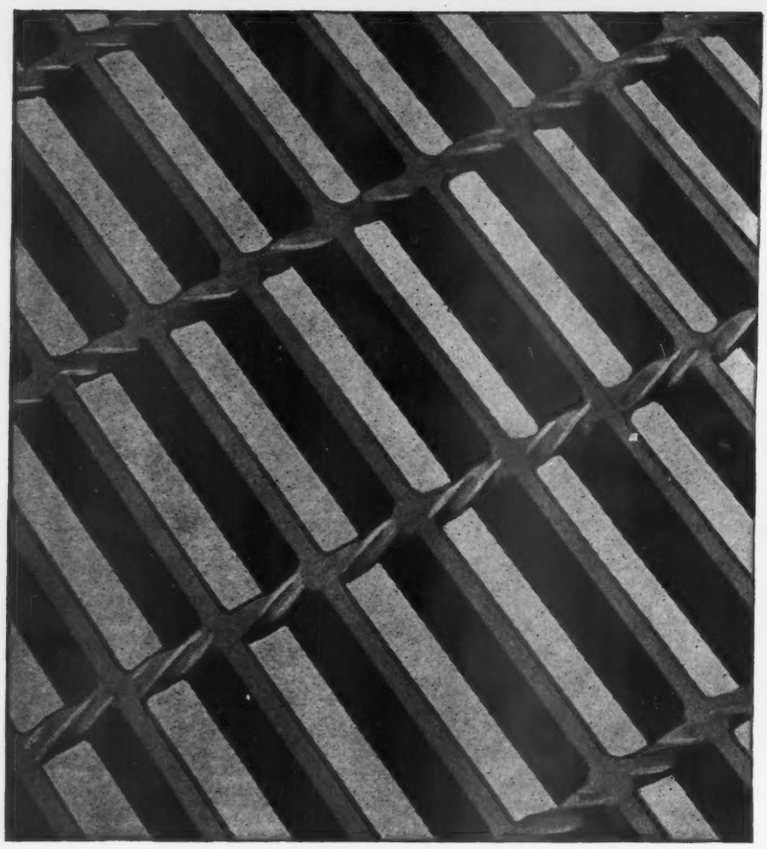
BLAW-KNOX *Electroforged Steel Grating*



to show you these 5 points of superiority

- ☑ Electroforged, one piece construction—strongest by test.
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- ☑ Self-cleaning, no sharp corners to clog with debris.
- ☑ Maximum open area for light and air.
- ☑ Easily maintained. No cracks or crevices; paint reaches entire surface.

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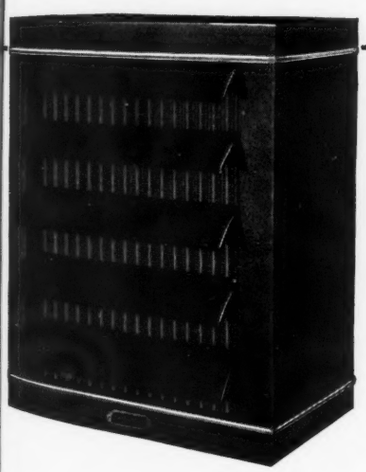
IDEAS THAT Clicked
HOW CAN WE HELP USERS SAVE ON HORSEPOWER AND STEP UP HEATING EFFICIENCY?
WIDE AREA BLADES! THAT'S THE ANSWER FOR EFFICIENCY
AND A STREAMLINED INLET TO SAVE HORSEPOWER
YOU'RE RIGHT. LOOK AT THE RESULT OF TESTS ON THESE 4 MAKES OF UNIT HEATERS!
IT'S A GREAT IDEA!

"How can we help users save on horsepower and step up heating efficiency?" This question was asked and solved by American Blower research engineers who are constantly searching for new ways to give the buyer more for his money. Outstanding economy features of American Blower Unit Heaters are the result of ideas developed and proved practical in the laboratory and under actual operating conditions . . . The streamlined inlet reduces the air flow to a minimum — saves power, and insures quieter operation. Wide area (epicycloidal) blades handle a larger volume of air with less horsepower. For example: Research tests prove that an American Blower Unit Heater (Size 1936) delivers, with less than one half the horsepower, the same b.t.u. at the same outlet velocity as four competitive makes. Where higher outlet velocities are needed, an American Blower Heater No. 1736 delivered the same b.t.u., with the same horsepower, at 47½% higher outlet velocity than the four competitive makes.



Now More Economical Heating For Your Plant or Business

Here's an idea in heating that clicked because it means quick, positive heating results and big savings on fuel and upkeep—American Blower Unit Heaters, built especially for plants hard to heat. The High Velocity Venturafin forces the warm air right where you want it—keeps working zone temperatures in the comfort zone! This remarkable American Blower unit has high outlet velocities and correct design for carrying heat long distances with minimum noise. For smaller areas and where quiet operation is essential, the Low Velocity Venturafin is ideal. No guesswork is necessary when you buy Venturafin —the only Unit Heaters with catalogued sound ratings and a long list of exclusive money saving features! . . . Buy rugged American Blower Unit Heaters for your plant or business NOW! . . . KEEP COMFORTABLE in coldest weather!

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Buy American Blower Unit Heaters NOW from any Accredited American Blower Contractor-Dealer. Save on operating costs and save on our new low prices. You can buy on easy F.H.A. terms through our affiliate, The Heating and Plumbing Finance Corporation. See the nearest Accredited Dealer *today!*

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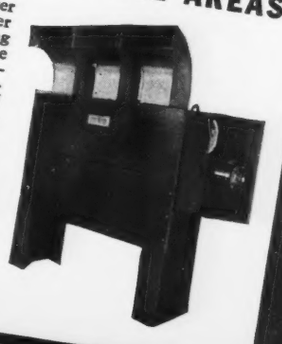
American Blower also has the answer for better heating results in large industrial areas — Sirocco Unit Heaters, capable of moving tremendous volumes of warm air. For complete data on the application of Sirocco Unit Heaters in any area, phone or write the nearest American Blower Branch Office. Don't delay.



AMERICAN BLOWER

American Blower Corporation, 6000 Russell St., Detroit, Mich. • Division of the American Radiator and Standard Sanitary Corp. • Canadian Sirocco Co., Ltd., Windsor, Ontario

When Economy is important—

Use *Gold Stripe* Brushes

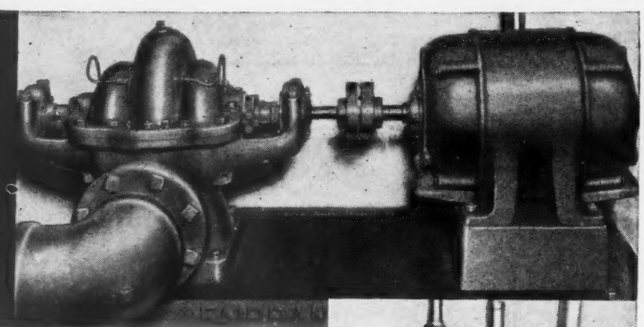
NO costly delays in your production or maintenance. Your brush orders filled on a "back-the-same-day" basis. One of the 77 distributing warehouses dotting the United States from coast to coast is close at hand no matter where you are located. Each warehouse carries the famous *Gold Stripe* brushes and also a full line of industrial brushes.

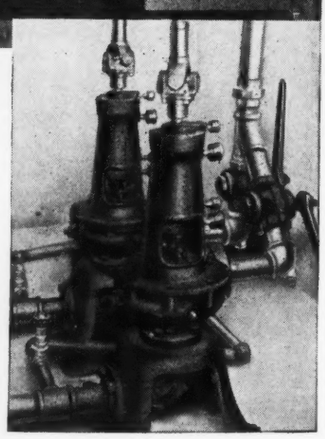
Write to-day for free illustrated catalog of maintenance or production brushes.

PITTSBURGH
PLATE GLASS COMPANY
BRUSH DIVISION · BALTIMORE, MD.

BRISTLE, WIRE AND TAMPICO BRUSHES FOR EVERY INDUSTRIAL NEED

F-M TRASH AND CENTRIFUGAL PUMPS USED IN CAMPANA SEWAGE DISPOSAL PLANT





● Three Fairbanks-Morse motor-driven pumps handle important jobs in the new Putnam Process sewage disposal plant recently completed by the Campana Sales Co., one of America's largest manufacturers of cosmetics.

Water for backwashing the filters and recirculating through the plant is pumped by an F-M Fig. 5811 5-inch bronze fitted centrifugal pump, which delivers 750 gallons per minute at 30 feet total dynamic head. This motor is direct-connected through a flexible coupling to an F-M 7½-hp. splash-proof motor.

Two F-M Fig. 5411 2-inch vertical trash pumps lift sewage into the mixing tank at 100 gallons per minute against a total dynamic head of 20 feet. These are direct-connected through flexible shafts to F-M 2-hp. motors.

No matter what type of pumping problem you have, there is an F-M pump built for the job. It won't have to be "adapted." You make no compromise that impairs efficiency or increases cost. Your inquiry will bring intelligent assistance —*not* insistence. Write Fairbanks, Morse & Co., Department 30, 600 S. Michigan Ave., Chicago, Ill. 35 branches at your service throughout the United States.

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REFRIGERATORS · RADIOS · WASHERS · FARM EQUIPMENT · STOKERS · AIR CONDITIONERS

Pumps

WANT STEEL IN A HURRY?

YOU CAN COUNT ON SCULLY SERVICE

HERE'S A GOOD EXAMPLE OF SCULLY SERVICE
Perhaps emergency orders are rare in your plant. Even so, it pays to get your steel from a source of supply that is both willing and equipped to meet emergencies such as this one:
12:30 at night — a breakdown occurs—in one of Cleveland's large industrial plants. Foreman calls our Cleveland Warehouse at once. Workmen quickly cut the needed bar of shafting.
All ready for the customer the same morning.
Scully Service

TRY as you will to keep ample stocks on hand, don't you, every once in a while, need steel in a hurry to keep production on schedule? That's the time to try Scully Service. When you tell us you're in a rush, we act accordingly. Your order is filled as fast as is humanly possible. Our respect for your emergency orders comes ahead of our respect for quitting time and holidays. Scully "minute men" are always ready for your call.

For regular orders, too, call Scully. Each of our eight warehouses has a large stock of steel, steel products, copper and brass. Each one is equipped to handle your orders fully, promptly.

Send for our handy, complete Stock List and Reference Book. It's free, of course.

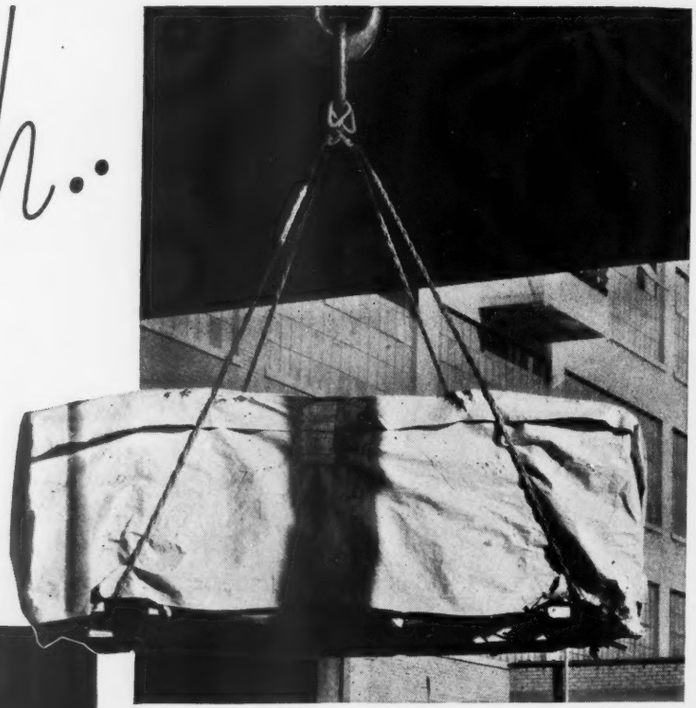
SCULLY STEEL PRODUCTS COMPANY

Distributors of Steel, Steel Products, Copper and Brass
Warehouses at
CHICAGO · NEWARK, N. J. · ST. LOUIS · BOSTON · ST. PAUL
CLEVELAND · PITTSBURGH · BALTIMORE

UNITED STATES STEEL

Swing high..

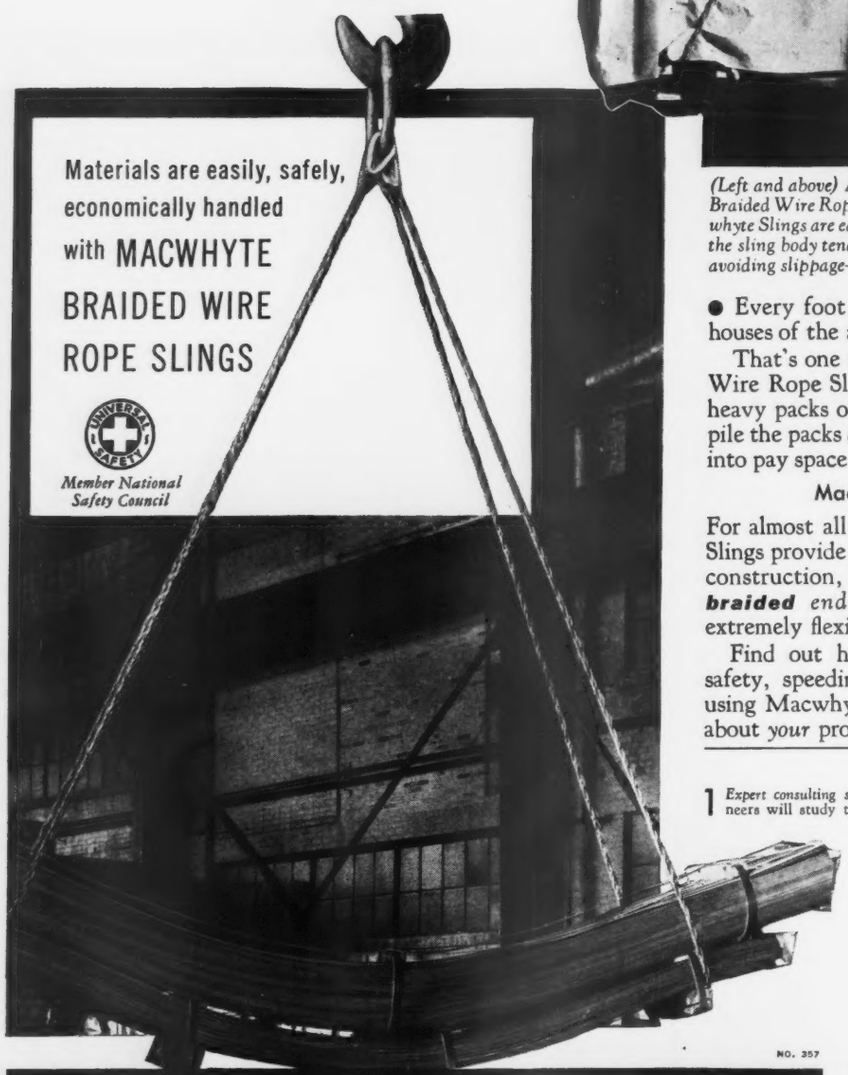
SWING LOW



(Left and above) A famous automobile manufacturer uses Macwhyte Braided Wire Rope Slings. Unusually light-weight for their size, Macwhyte Slings are easily and quickly put around the load. On all corners the sling body tends to spread, grips the load with fingers of steel thus avoiding slippage—an outstanding safety precaution.

Materials are easily, safely, economically handled with MACWHYTE BRAIDED WIRE ROPE SLINGS

Member National Safety Council



● Every foot of space is worth money in the warehouses of the automobile industry.

That's one reason why they use Macwhyte Braided Wire Rope Slings. With Macwhyte Slings they swing heavy packs of sheets from gondola to warehouse . . . pile the packs *extra* close together . . . turn waste space into pay space . . . and do the job swiftly, easily, safely.

Macwhyte Slings Easy to Handle

For almost all kinds of materials handling, Macwhyte Slings provide an ideal solution. Their patented special construction, made up of ***right and left lay ropes braided*** *endless*, makes them unusually strong, extremely flexible.

Find out how leading manufacturers are assuring safety, speeding up operations, decreasing costs by using Macwhyte Braided Wire Rope Slings. Write us about *your* problems.

You Get All Three

1 *Expert consulting service.* Write us about *your* handling problems. Our engineers will study them, help you solve them, show you how to get better service at lower cost.

2 *"How to Handle Loads Safely"* . . . an on-the-job booklet showing how Macwhyte Slings solve materials handling problems of every kind, every day. Send for this booklet No. 37-125.

3 *"Safe Handling"* . . . 12 pages of large pictures—over 30 views of Macwhyte Braided Slings handling loads safely. A companion booklet to "How to Handle Loads Safely". Send for it—No. 38-100.

NO. 357

MACWHYTE

Braided WIRE ROPE *Slings*

MACWHYTE COMPANY
KENOSHA, WISCONSIN

Manufacturers of Wire Rope and Braided Wire Rope Slings.

• Distributors and direct factory representatives throughout the U. S. A.

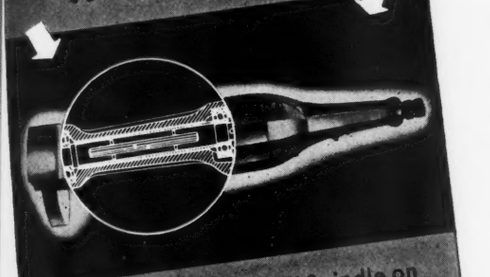
Thor GRINDERS

ARE PERFECTED FOR PRODUCTION SERVICE

"Yes, Sir! You can use faster grinding methods Without Fear of high upkeep with Thor Portable Grinders"

NOW you can put portable electric grinders on your toughest grinding jobs . . . and know that they won't "give up". All the labor and time saving advantages of bringing the tool to the work can now be had without fear of costly motor burnouts halting production.

CROSS-SECTION OF A Cost-Cutter



The "Shock-Absorber" Spindle on Thor Portable Grinders is a two piece shaft, joined with resilient steel strips. It absorbs and STOPS all vibration at the spindle . . . the resilient steel strips — not the motor — take the terrific shocks when these powerful grinders go to work.

Vibration-Control CUTS GRINDING COSTS

● Thor portable electric grinders are perfected for production service. A patented "Shock-Absorber" Spindle takes the terrific grinding shocks and STOPS all vibration . . . before it reaches the motor! This method of Vibration Control prevents lead wires from breaking and causing burnouts. It assures dependable performance and low maintenance costs, as well as smooth operation, easy handling and longer service life for Thor Portable Grinders.

INDEPENDENT PNEUMATIC TOOL COMPANY

600 WEST JACKSON BOULEVARD · CHICAGO, ILLINOIS

New York Pittsburgh San Francisco St. Louis

"30 days trial at Thor's own risk. You'll see how a Thor Grinder pays for itself"

GRINDER BOOKLET Free

Independent Pneumatic Tool Co.
600 W. Jackson Blvd., Chicago, Ill.

Without obligation to us, send all the facts on how we can eliminate costly handling, save hours of productive time and slash grinding costs with Thor Portable Electric Grinders.

NAME_____

ADDRESS_____

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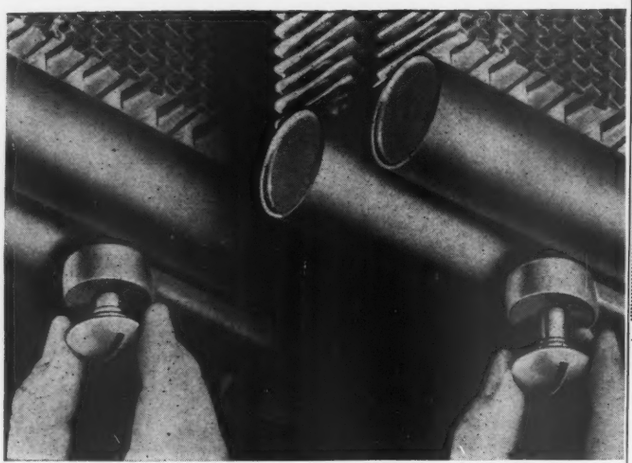
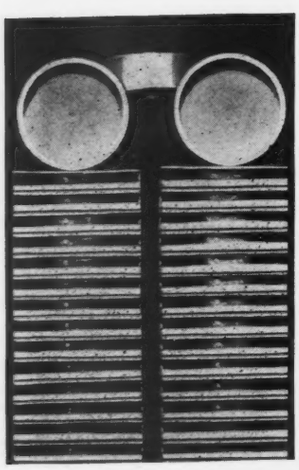
TOOL MAKERS Thor SINCE 1893

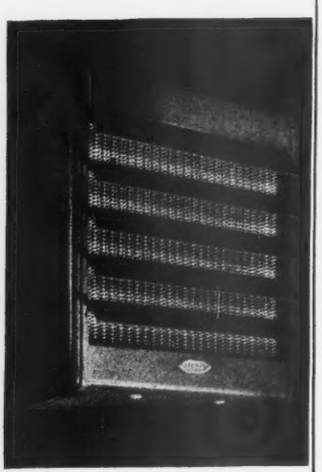
PORTABLE ELECTRIC TOOLS

The same aerodynamic principles responsible for the sensational performance of modern airplanes are used in the streamline tubes and saddle fins of



Fedders Series 4 Unit Heaters. Above photograph shows how patented Full-Floating element mounting eliminates expansion stresses between Fedders heating element and cabinet.





Fedders exclusive Double Headers assure unusually free steam passages. Double Headers are manifolded in center. Note how the handsome appearance of Fedders Series 4 Unit Heaters makes them well adapted for use in commercial establishments as well as industrial applications. Write for new Bulletin 573. Fedders Manufacturing Co., 57 Tonawanda St., Buffalo, N. Y.

The Gears That Insure both Strength and Silence!

WALDRON *Laminated* SILENT STEEL *Gears*

WITH THESE ADVANTAGES

Assurance of much longer life than that of any non-metallic gear because they are All Steel and provide a Tooth Profile that will not deform to cause rubbing or wear. The steel laminations reduce noise vibration and afford cushioning to insure quiet operation. Because loading is normal to these steel laminations, tooth breakage is practically eliminated. Here are Quiet Gears that cut and hold a true strong Keyway — the only gears that give you both Strength and Silence.

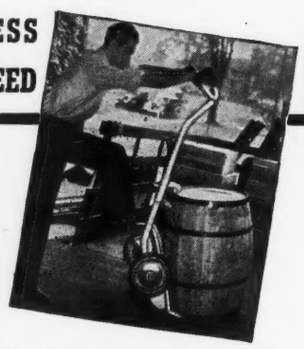
Write for Catalog No. 71 giving sizes, ratings, prices—Gears and Blanks.

JOHN WALDRON CORP.
NEW BRUNSWICK · NEW JERSEY

HERE'S YOUR ANSWER

for safe, easy handling of barrels and drums with

LESS WORK...LESS WEAR...MORE SPEED

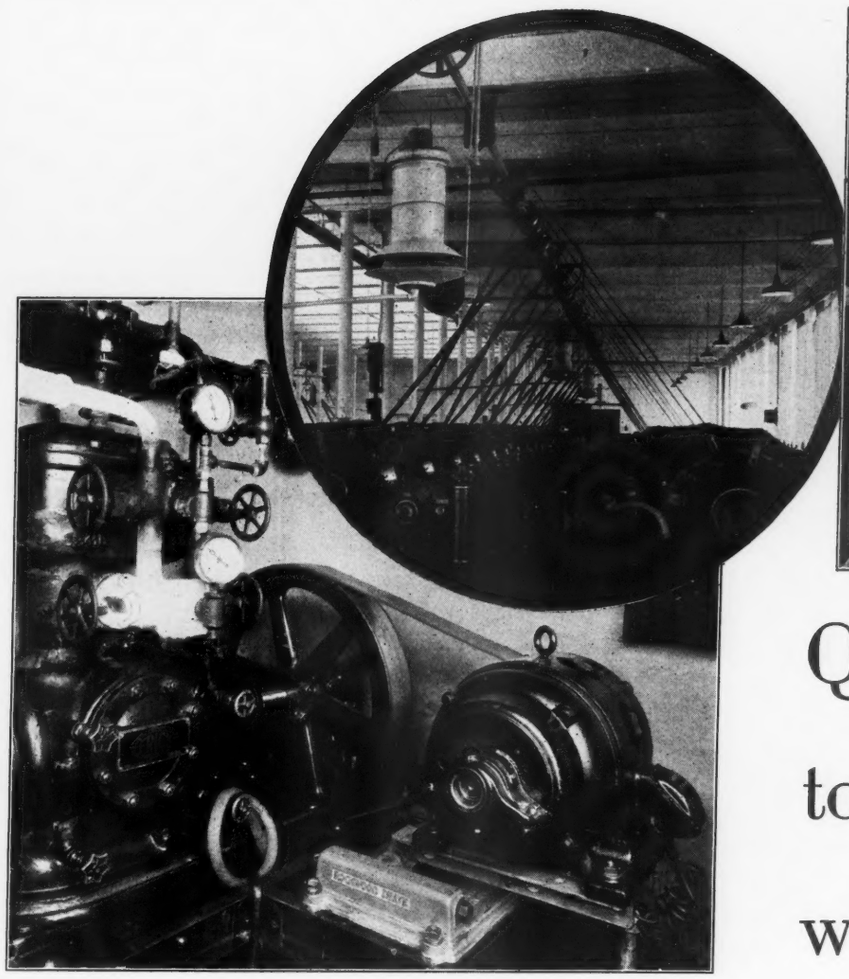


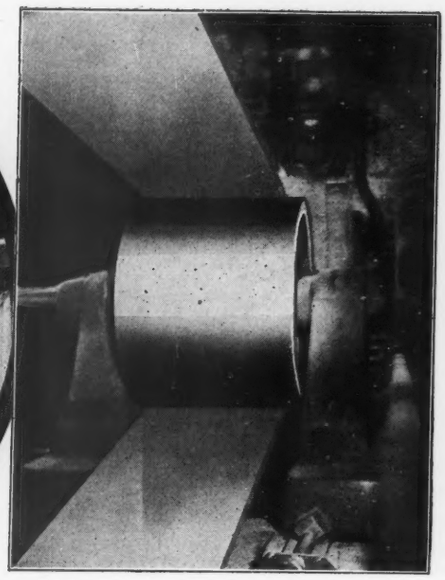
PUT one of Colson's new Universal Drum Trucks on your shipping platform or in your warehouse and watch every trucker go for the Colson *first.*

Here's a truck that provides the fastest, safest means of handling any barrel or drum. No lifting is required, either in loading or unloading. The operator only maintains balance and pushes the truck. All the load is carried over the wheels.

Rugged, all steel welded construction gives you a truck able to stand up under hard, continuous use. Wheels are ball bearing, either steel or rubber tired. The hook can be instantly adjusted and set for barrels or drums from 24 to 40 inches in height. Handles are shaped to protect the operator at all times. Write for complete specifications.

THE COLSON CORPORATION
346 CEDAR STREET • ELYRIA, OHIO





Quick Ways to Profit with . . .

Rhoads TANNATE Belting

5 RHOADS TANNATE ECONOMY FACTORS To Increase Your Profits Per Unit of Production

1. **GREATER PRODUCTION** . . . —through *maximum power transmission capacity* even under heavy load.
2. **HIGHER QUALITY OF OUTPUT** —through *steady flow of power* under varying condition of load.
3. **LOWER REPLACEMENT COSTS** —through *longer service-life.*
4. **LOWER MAINTENANCE COSTS** —through *greater resistance to wear.*
5. **ASSURANCE OF SATISFACTION** —through *Rhoads Service Guarantee.*

• Here are three typical ways in which TANNATE Leather Belts make extra profits and save money for their owners. *Upper Right*: A 28" TANNATE Belt still in use after 28 years of steady paper-mill service. That's durability! *Center*: TANNATE-equipped textile mill, just one of many using TANNATE Belts because they reduce annual expenditure for belts and increase production. *Lower Left*: On short center drives TANNATE'S unusual grip and durability assure higher efficiency and real economy. Let our Engineering Department or one of our salesmen show you the profit possibilities in your plant of TANNATE Leather Belting.

Write us TODAY.

J. E. RHOADS & SONS

Established 1702

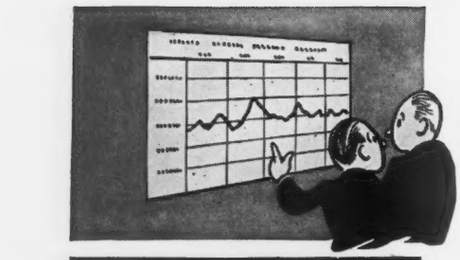
Philadelphia, 35 N. Sixth Street

New York Chicago Atlanta Cleveland

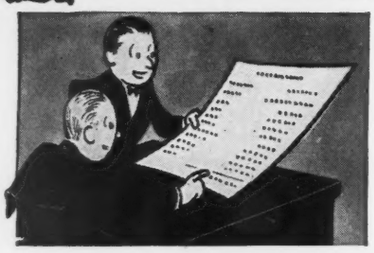
Factory and Tannery, Wilmington, Del.

TANNATE LEATHER BELTING

LOWERS COSTS Per Unit of Production



"We want an air compressor that meets our air needs exactly—to insure adequate and economical operation"

"With our limited floor space, we need a compressor that packs a lot of air output in small area"

"Low horsepower per cubic foot of air delivered is another 'must' for our air compressor"

"Naturally, we need an absolutely dependable compressor—production must be uninterrupted"

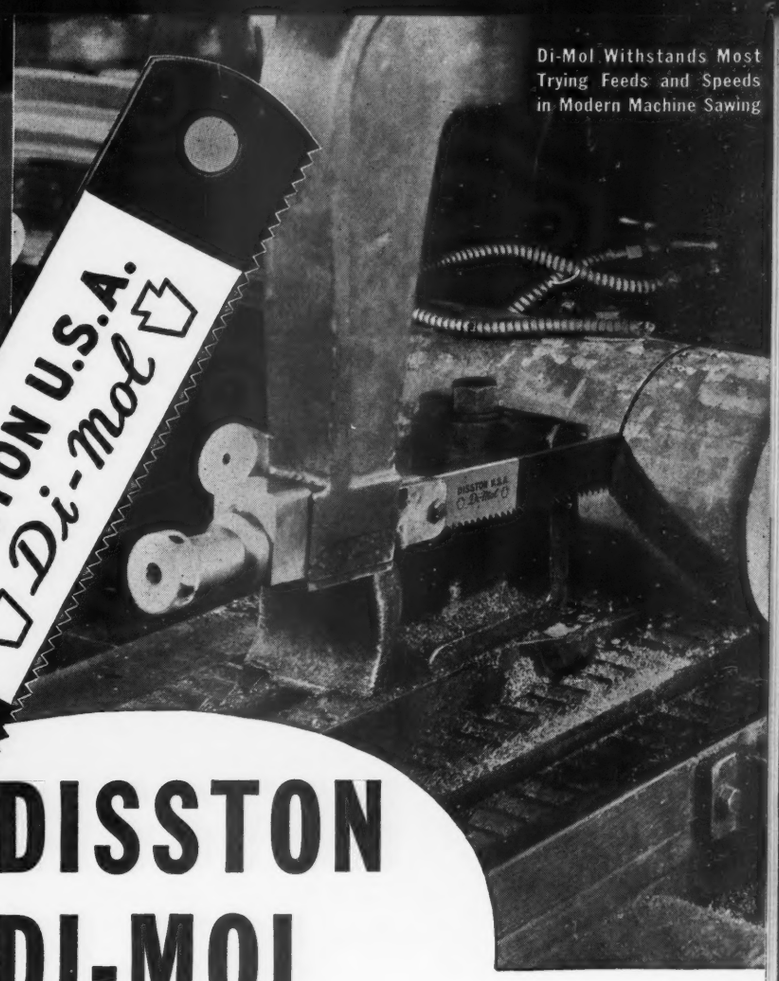
THE ANSWER IS A GARDNER-DENVER "RX" COMPRESSOR

Gardner-Denver "RX" Compressors are made in capacities from 89 to 628 c.f.m. for 100 lb. pressure, also in larger capacities for low pressure and vacuum service. They are available in sizes to fit your floor space, using any type drive. The horsepower consumed per cubic foot of air delivered is consistently *low*. Here's a compressor that fits YOUR needs—write for our bulletin giving complete facts and engineering data. Gardner-Denver Company, Quincy, Illinois.

Since 1859

GARDNER-DENVER

Disston Di-Mol Blades Need no Coddling in the Hands of Shop Men



Di-Mol Withstands Most Trying Feeds and Speeds in Modern Machine Sawing

DISSTON DI-MOL

cuts faster . . . lasts longer

Disston Di-Mol means amazing economy in hack saw blades. Needs no coddling in hands of shop men . . . withstands strain of trying feeds and speeds developed in machine sawing. Has the stamina to meet modern conditions!

This new, sensational value has quality and uniformity assured by the Disston name . . . Disston Di-Mol (on orange band on blade). Standard teeth, lengths, widths, thicknesses. Hand blades, ½ gross in box. Machine blades, 1 dozen.

Order from your Distributor of Disston Di-Mol Blades. Try them on special steels, modern alloys, castings and the like. Henry Disston & Sons, Inc., Philadelphia, U. S. A. *Branches:* Boston, Chicago, Detroit, Memphis, New Orleans, Seattle, Wash., Portland, Ore., San Francisco, Vancouver, B. C. *Canadian Factory:* Toronto.

FOR DEMONSTRATION WRITE YOUR DISTRIBUTOR OF DISSTON DI-MOL HACK SAW BLADES

DISSTON HIGH-SPEED STEEL BLADES

Successful in cutting materials of extreme hardness, such as pivot steel, die steel, nickel chrome alloy. High-Speed steel made in Disston electric furnaces—plus Disston workmanship in the blade—is today's answer to unusual sawing conditions.

DISSTON DI-MOL

HACK SAW BLADES

Here are workable schemes for dealing with problems of unemployment—

advanced by leading business men

Just Out!

Toward Full Employment

BY HENRY S. DENNISON
President, Dennison Manufacturing Co.

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President, William Filene's Sons Co.

RALPH E. FLANDERS
President, Jones & Lamson Machine Co.

MORRIS E. LEEDS
President, Leeds & Northrup Co.

297 pages, 5½ x 8, $2.50

THIS book suggests a means for dealing with the problems of unemployment, considering the situation from the standpoint of preventive measures to be applied in the early stages of business recession. It presents a program for the orderly provision of employment through fluctuating government activity and expenditures on a pre-planned and pre-budgeted basis; and discusses the financial system which is necessarily involved, and the taxation which must furnish the required funds for such government activity.

The book discusses such questions as:

Is there a workable method for determining when unemployment has reached the point at which government action should be initiated?
Can the supplementary work which unemployment calls for be budgeted in advance?
Are there ways of avoiding the dangers of government borrowing and expenditure for unemployment?
Is a Federal-state tax commission necessary?

"This book is a most significant indication of the fact that among our industrial leaders are constructive thinkers, willing to adjust traditional attitudes to new circumstances . . . to make possible the preservation of our economy under a political democracy."—**Jerome N. Frank, Securities and Exchange Commission.**

Examine it for 10 days on approval. Send this coupon.

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Send me Dennison, Filene, Flanders, Leeds—Toward Full Employment for 10 days' examination on approval. In 10 days I will send $2.50, plus few cents postage, or return book postpaid. (We pay postage on orders accompanied by remittance.)

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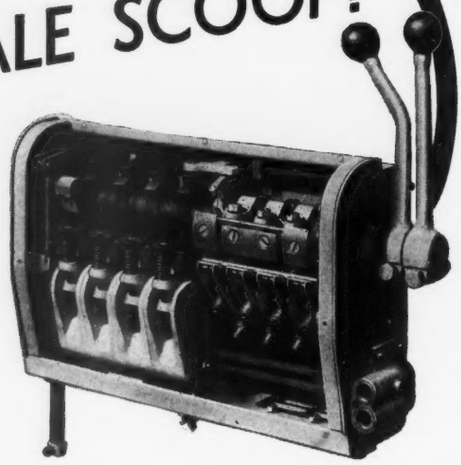
ANOTHER YALE SCOOP!

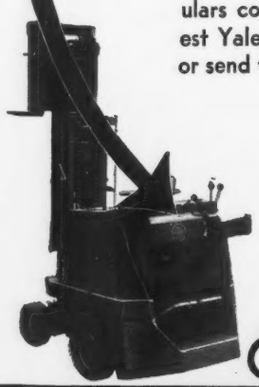


THE CAM-O-TACTOR

Once again Yale paces the field with a brand new Electric Truck engineering advance—Cam-O-Tactor Control.

Entirely different—this new type controller combines the high current interrupting capacities and long life of contactors with the positive action and safety of mechanical cam-operation. In addition it accomplishes the make and break contacts without creating the usual sticking or welding of electrical surfaces . . . EVEN WHEN UNDER EXTREME VIBRATION OR FLUCTUATION OF VOLTAGE!

And don't forget—ONLY Yale trucks can bring you these outstanding improvements because ONLY Yale trucks feature Cam-O-Tactor Control! For further particulars contact the nearest Yale representative or send for Free Folder.



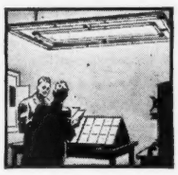
FREE FOLDER

Complete details on Cam-O-Tactor Control. You should know all about this very latest development. A Folder is yours without obligation. Just send for it.

YALE

THE YALE & TOWNE MFG. CO.
PHILADELPHIA DIVISION
PHILADELPHIA, PA., U. S. A.

G-E FLUORESCENT MAZDA LAMPS PROVIDE NEW INDOOR DAYLIGHT



The new G-E Fluorescent MAZDA lamps offer shops, factories, and industrial plants almost unlimited possibilities wherever daylight effects or colored light sources are wanted. They give several times more light for the current consumed than filament lamps of the same wattage and color. For the same amount of light, they are 50% cooler.

The daylight Fluorescent lamp offers the closest approach to real daylight ever produced at high efficiency. It will be particularly useful for industries where color discrimination is important.

These new lamps (also available in red, gold, pink, blue, green, and white) require special sockets and control equipment which is now available.

Look for this tag when you buy fluorescent lighting equipment →

The new G-E Fluorescent MAZDA lamps come in 18, 24, and 36-inch lengths and in 15, 20, and 30-watt sizes. Prices run from $1.50 to $2.10.

Certified as to Compliance with Specifications for Fixtures Using Fluorescent MAZDA Lamps.
ELECTRICAL TESTING LABORATORIES
NEW YORK, N. Y.
One Emblem Must be Affixed
For Each Tube in Fixture

GENERAL ELECTRIC *presents*

2 REVOLUTIONARY NEW MAZDA LAMPS

G-E MAZDA PROJECTOR LAMPS ARE COMPLETE LIGHTING UNITS

Here is another new type of lamp never before available! The G-E MAZDA Projector lamp that combines a mirror reflector, a light-directing lens, and a 150-watt lamp filament in one hermetically sealed-in unit, protected from dust, moisture, and deterioration. Available in two types—Spotlight type which has a concentrating lens and produces a narrow light beam of high intensity, and the Floodlight type with a lens that spreads the beam to illuminate a larger area. Both types list at $1.70.

• • •

General Electric also presents the 150-watt MAZDA Reflector lamp (see inset photo at lower right). With the same type of mirrored surface used on the Projector lamps, the Reflector lamp is made of ordinary glass, and will be of value wherever a smaller, lightweight lamp with a beam of less intensity is needed. Its use is also recommended where lower first cost is important. Price $1.10.

The new G-E MAZDA Projector lamps are made of heat-resisting glass, permitting outdoor use.

G-E MAZDA REFLECTOR LAMPS

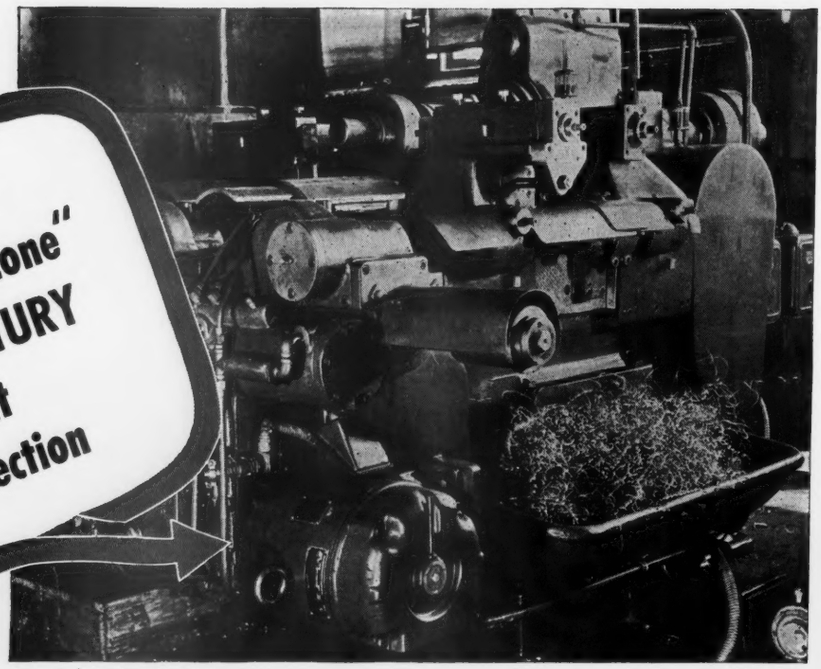
MAIL THIS COUPON FOR COMPLETE INFORMATION

General Electric Co., Dept. 166-FM, Nela Park, Cleveland, O.
Please send me complete information on:
A) G-E Fluorescent MAZDA lamps. ☐
B) G-E MAZDA Projector and Reflector lamps. ☐

Name .....

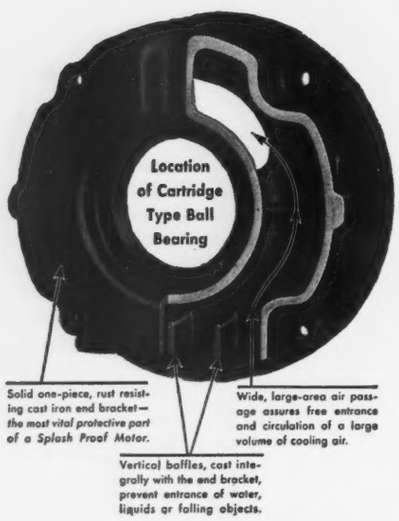
Company .....

Address .....



Long Motor Life Below the "Work Zone" Assured by CENTURY Permanent Motor Protection

FALLING CHIPS AND SPLASHING OIL CAN'T DAMAGE THIS CENTURY SPLASH PROOF MACHINE TOOL MOTOR


Location of Cartridge Type Ball Bearing
Solid one-piece, rust resisting cast iron end bracket—the most vital protective part of a Splash Proof Motor.
Wide, large-area air passage assures free entrance and circulation of a large volume of cooling air.
Vertical baffles, cast integrally with the end bracket, prevent entrance of water, liquids or falling objects.

It is often desirable to mount a motor below the bed of a machine tool. This, however, is the danger zone—where motors must be properly and permanently protected against falling chips, borings, grindings, oils and liquids which otherwise may easily enter the motor and damage its vital internal parts.

Century Splash Proof Motors have been specifically designed to assure complete protection against such damage—costly repair bills, time losses and unnecessary delays.

Note how the heavy, rigid one-piece frame encloses and protects the inside of the motor because it has no openings through which harmful particles may fall.

Note also the heavy one-piece cast-iron end bracket—see the diagram at the left—it shows how complete ventilation is obtained—how air passes through and splashing liquid is kept out.

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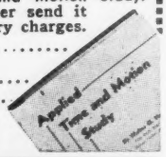

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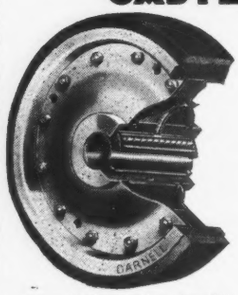

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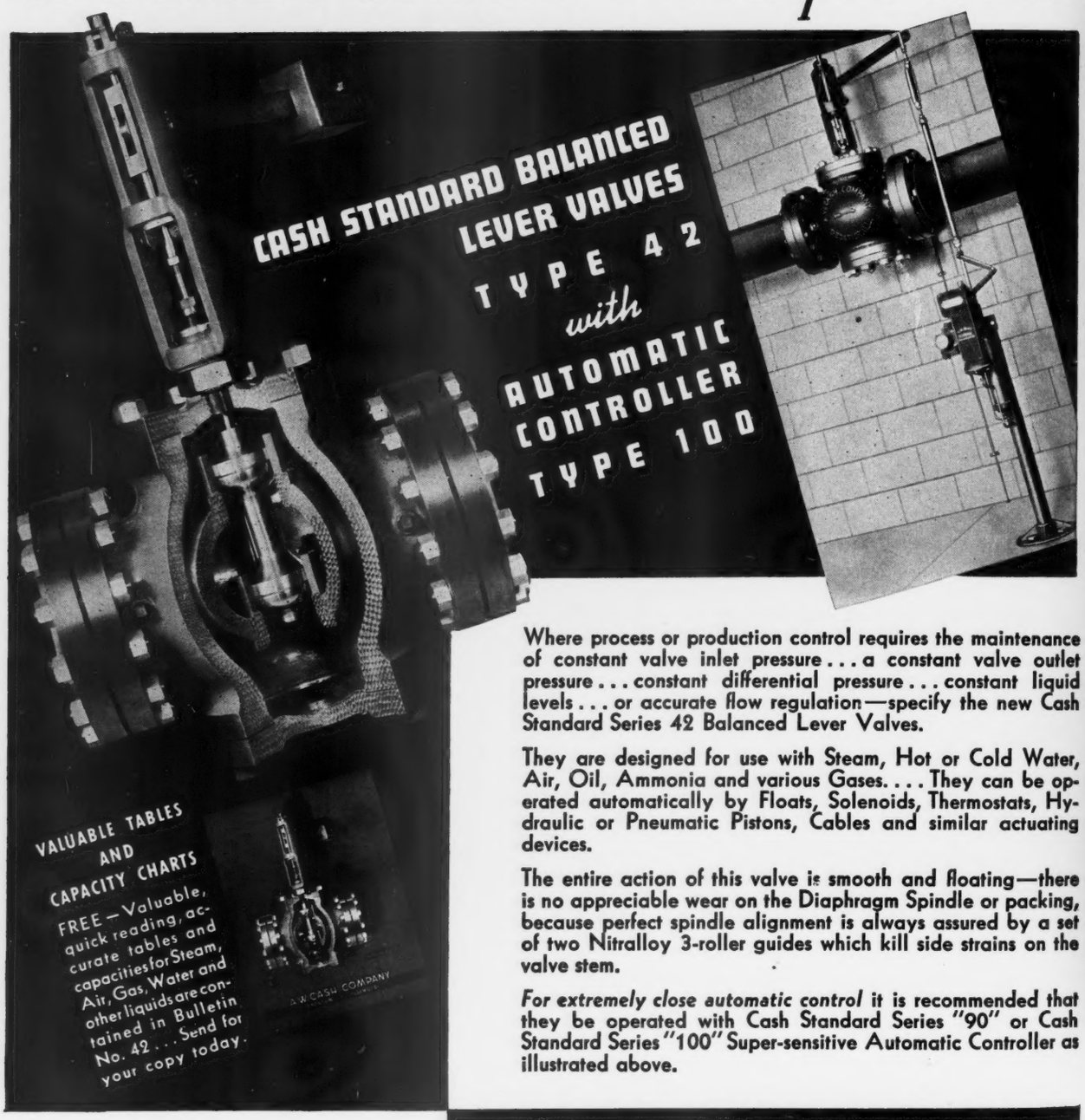
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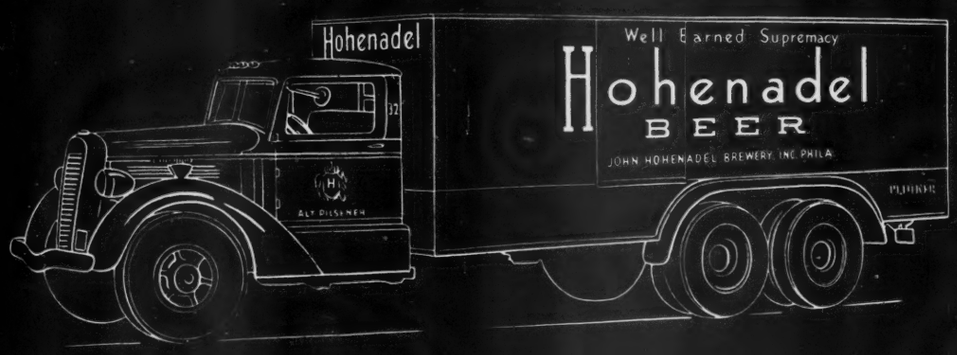

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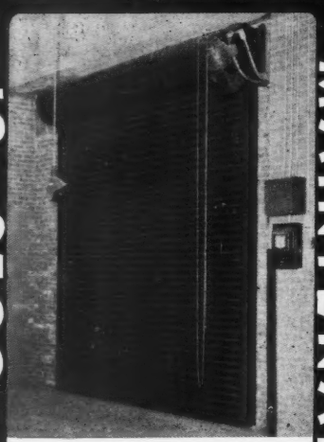

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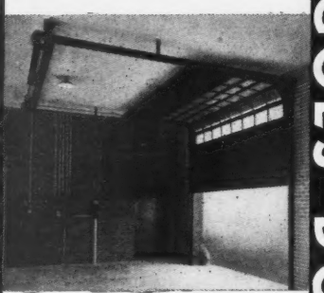

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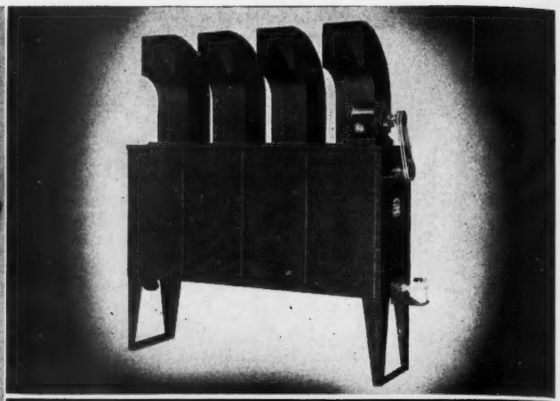

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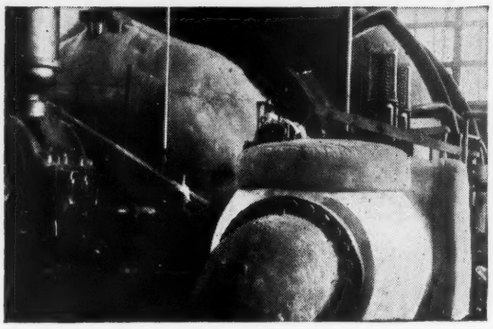
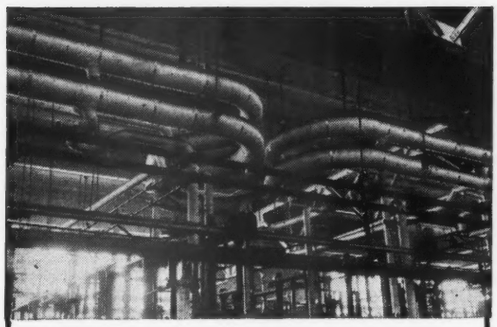


In many kinds of insulation, asbestos is used in some form. It can be woven into cloth, felted into paper or combined with other materials to form blocks and shapes. Here a steam turbine is protected against heat losses with a felted J-M Asbestos Blanket.



Heat loss from high-temperature steam lines represents wasted fuel and power. Asbestos was the first practical material used to prevent it. J-M Asbesto-Sponge Felted pipe insulation maintains its high efficiency indefinitely in this service.

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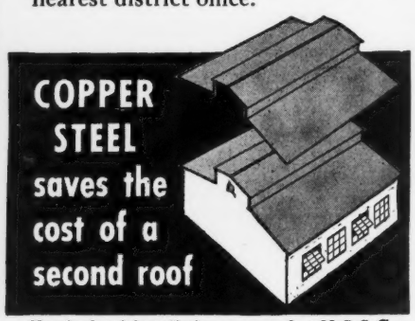

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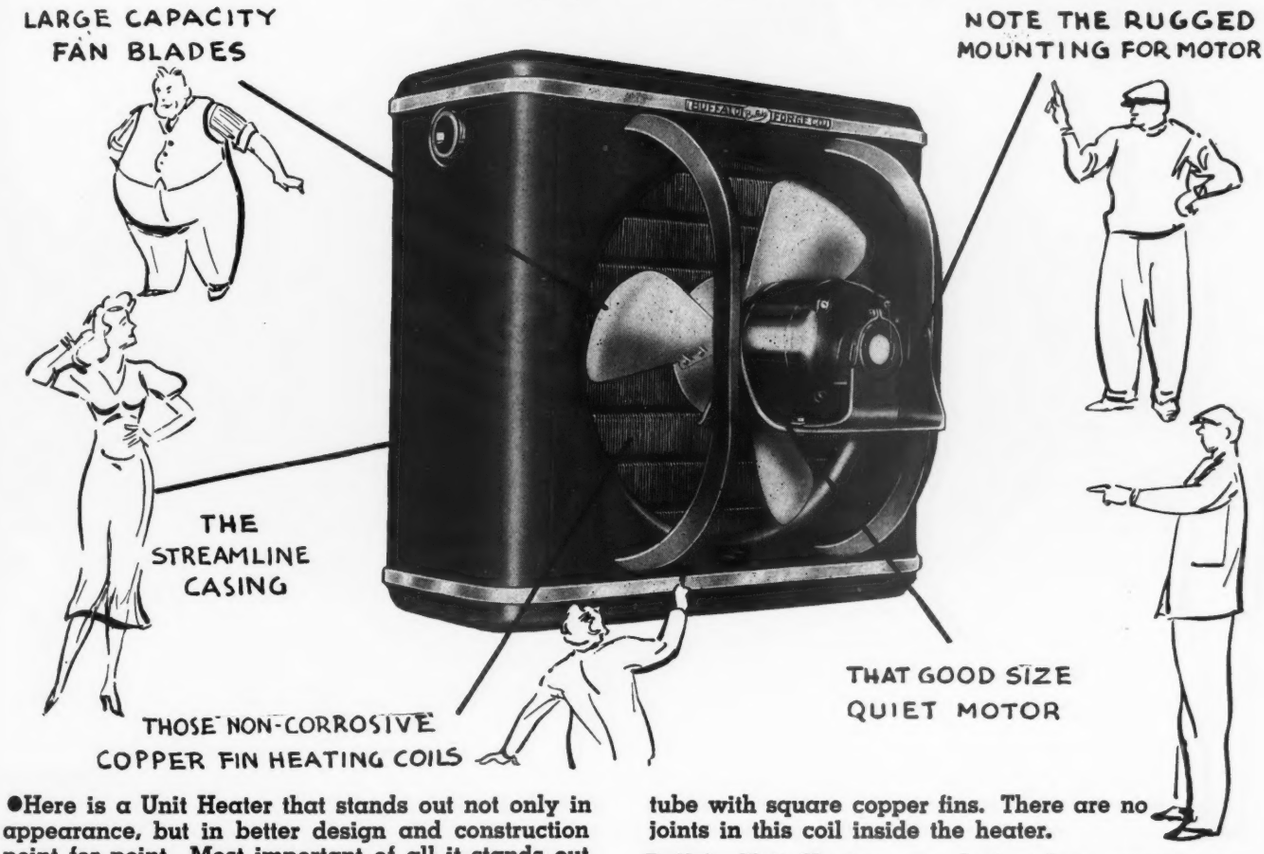
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THOSE NON-CORROSIVE COPPER FIN HEATING COILS
THAT GOOD SIZE QUIET MOTOR

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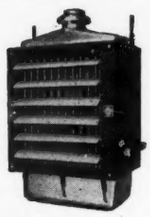

BUFFALO HIGHBOY UNIT HEATERS

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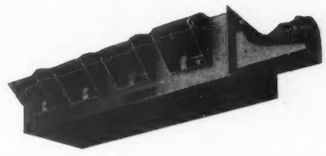
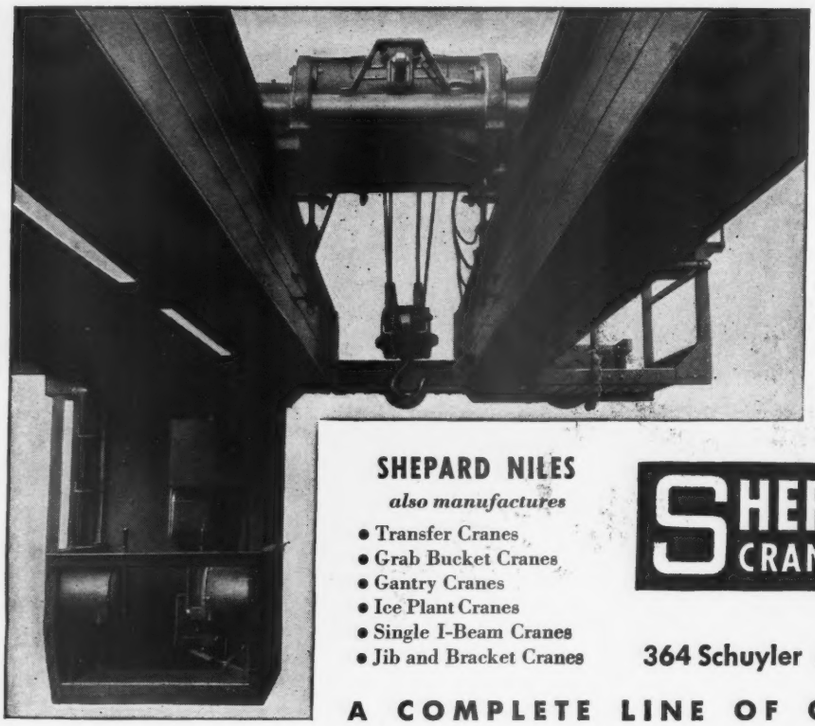


Welded BOX GIRDER CRANES



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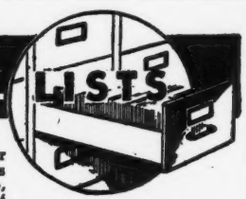

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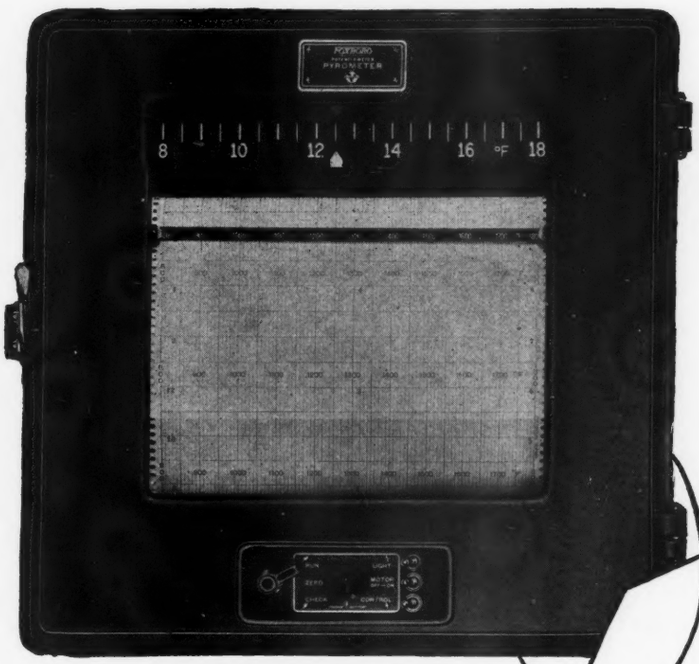

Improvements and conveniences have been added to the proved Foxboro Recorder design with its unique automatic balancing mechanism. Integral slide wire contact carriage, recording pen and control actuating mechanism banish lost motion and the inevitable inaccuracies. The mechanism which operates the control contacts is sensitive, dependable and mechanically simple. Hundreds of industrial installations have proved the dependability of this Rotating Contact Control System.

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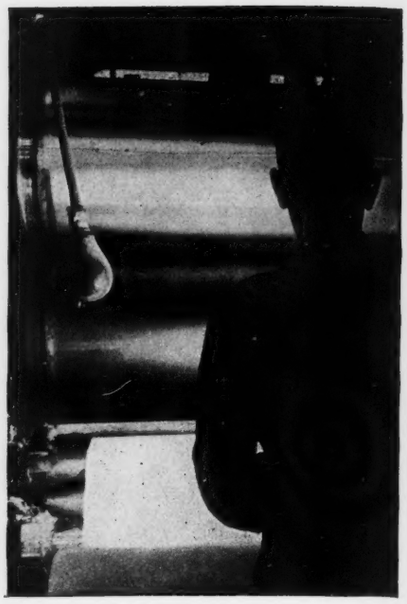

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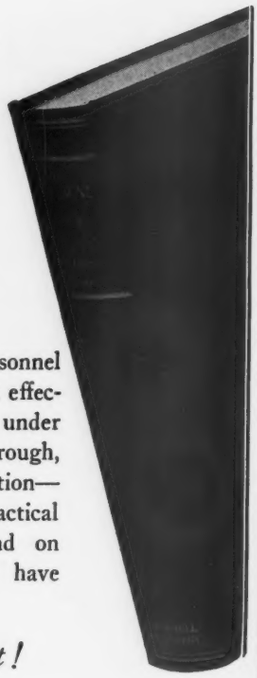

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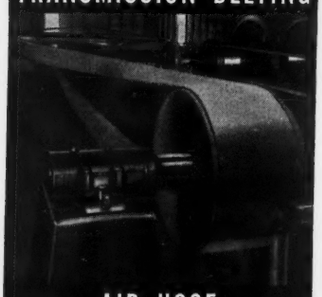
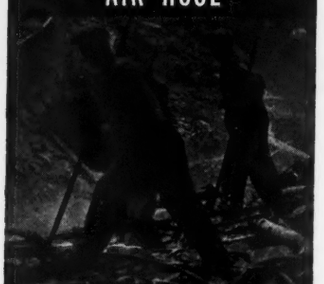


AIR HOSE



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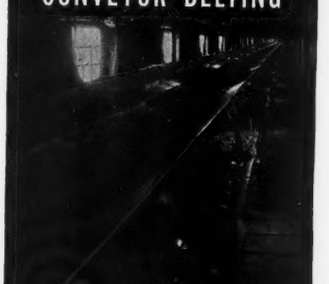

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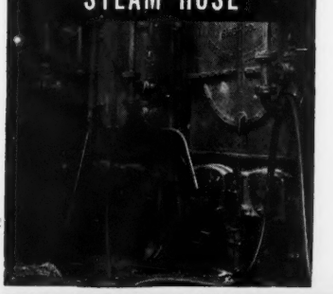

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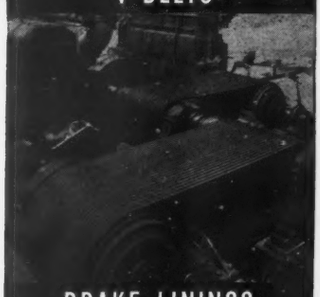
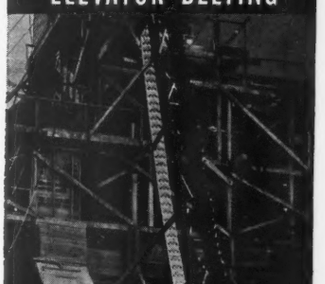
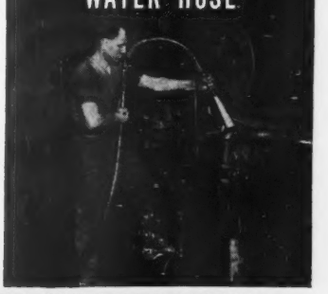


BRAKE LININGS

ELEVATOR BELTING



WATER HOSE



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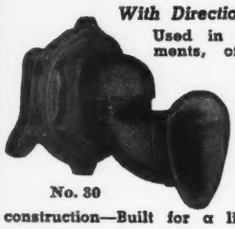

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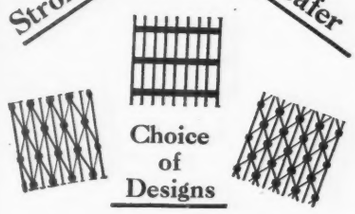

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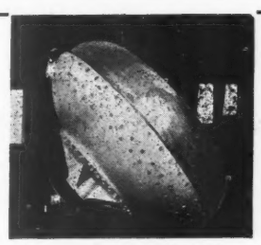

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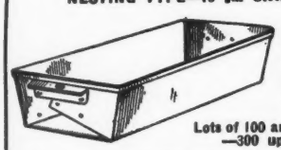

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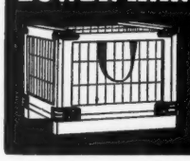

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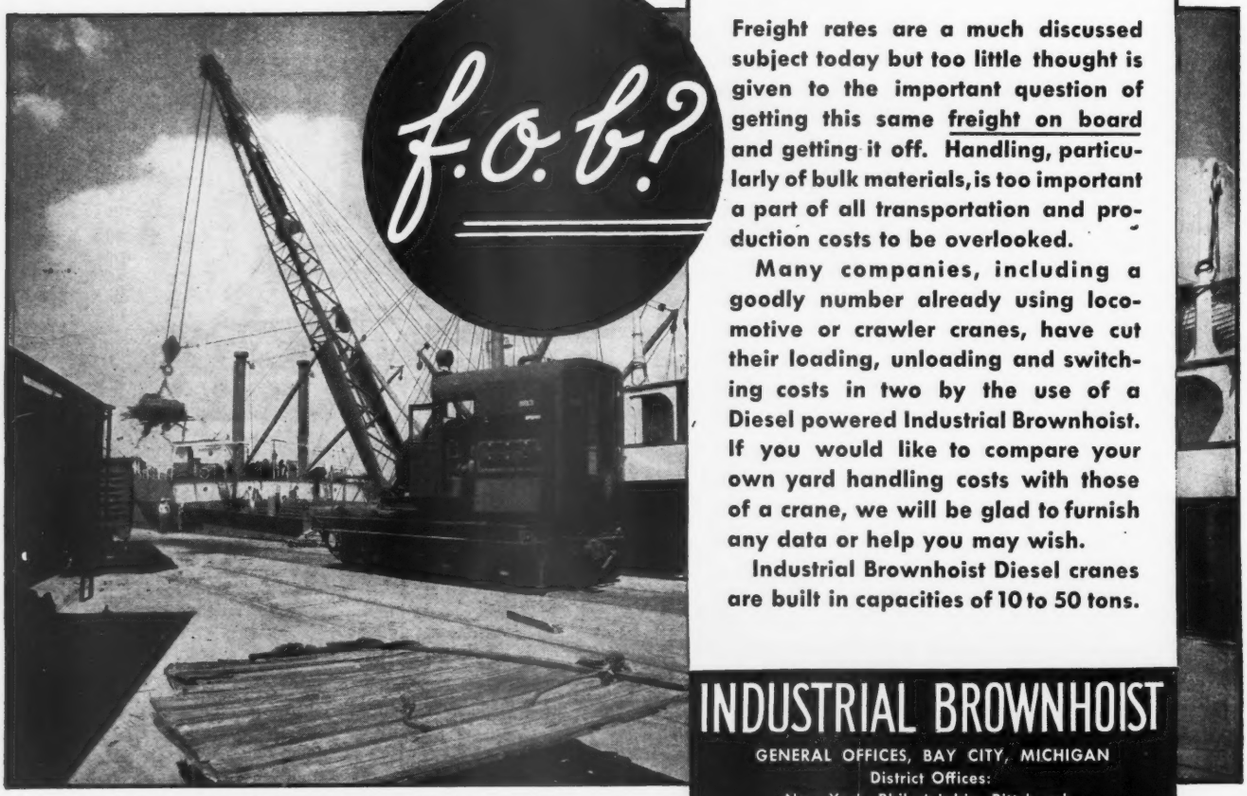

f.o.b.?

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Limited funds need not stop you from taking advantage of any of the "500 Quick Ways to Profits" that require purchasing equipment

CHECK THE STOCKS OF

USED EQUIPMENT

OFFERED ON PAGES 232-237

For the benefit of "Factory" readers handicapped by financial restrictions, representative nationally-known dealers feature in this issue their stocks of available USED Equipment. Many readers of "Factory" can undoubtedly find in the stocks of these dealers the items required to modernize or supplement their equipment operations AT THE NECESSARY SAVING IN COST to enable them to secure the benefits of many of the "500 Quick Ways to Profits."

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MANAGEMENT AND MAINTENANCE

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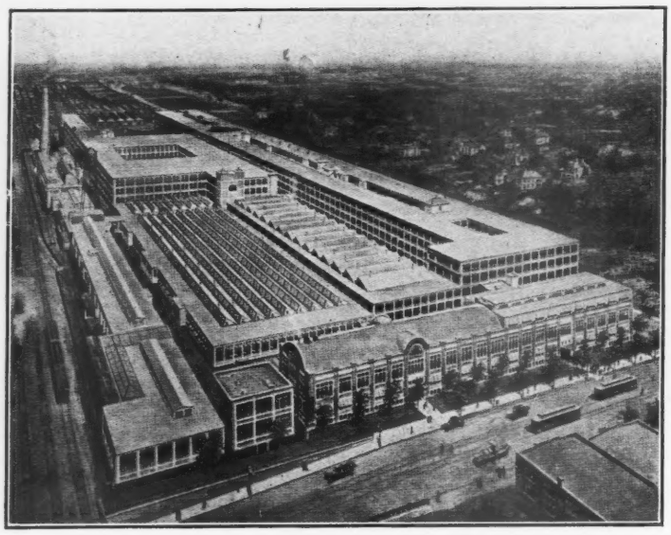

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For MAINTENANCE as well as for MANUFACTURING

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36″x24′ **Lodge & Shipley** Trip. Grd. Hd. **Lathe,** SPD, Taper
30″x20′ **American** 12 speed Grd. Hd. **Lathe,** SPD.
42″x20′ **American** H.D. Grd. Hd. **Lathe,** M.D.
No. 1 **Covington Plate Shear,** 13′x¼″, Arr. M.D.
No. 184 **Chicago Steel Power Bending Brake,** 8′x10 gauge, Arr. M.D.
24″x24″x8′ **G. A. Gray Planer**
48″x48″x12′ **Cleveland Openside Planer,** three heads
16″, 20″ & 24″ **Gould & Eberhardt High Duty Shapers,** four step cone drive
20″ **American Shaper,** four step cone drive
20″ **Barnes Drill Press,** quick change, back geared
24″ **Aurora Drill Press,** sliding head, quick change
No. 7 **Atkinson Kwik-Kut Hack Saw,** belt drive, 8″x8″
6″x6″ **Peerless Hack Saw,** belt drive
No. 2 **Brown & Sharpe Surface Grinder,** mag. chuck, belt drive, power feed
14″ **Pratt & Whitney B.B. Grinder,** mag. chuck, belt drive
No. 78 **Wilmarth & Morman Surface Grinder,** belt drive
No. 1 **Adams Farwell Gear Hobber**
No. 3-26″ **Brown & Sharpe Gear Cutter**
No. 2-A **Milwaukee Plain Miller,** SPD.
No. 3. **Cincinnati High Power Universal Miller,** cone drive, div. hd.
No. 3 **Kempsmith Universal Miller,** cone drive, div. hd.
No. 4 **Warner & Swasey** Plain Grd. Frict. Hd. **Turret Lathe,** bar feed, cone drive
14″x19″ **Fay Automatic Turret Lathe,** SPD.
No. 2-A **Warner & Swasey** Grd. Hd., SPD, Timken Bearings, serial over 350,000
1″ **Acme** Class A **Bolt Cutter,** cone drive
2″ **Acme** Class A **Bolt Cutters,** cone drive
2″ **Landis Bolt Cutter,** cone drive
No. 304-A **Oster Pipe Threading Machine,** cone drive

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DESIRABLE TOOLS

6′ **American** Triple purpose enclosed head **Radial Drill,** motor mounted on arm. 17″ column.
4′ **Cincinnati Bickford Radial Drill,** motor drive.
20″ **American Shapers,** motor drive through gear box (3).
#2 and 3B **Pratt & Whitney Jig Borers.**
#41 and 43 **Lucas Horizontal Boring Mills.**
#2 **Standard Milwaukee Millers,** motor in base, rapid traverse (4).
60″x12′ **Cleveland Open Side Planer,** 3 heads motor drive.
#2A **Warner & Swasey Universal Turret Lathe,** motor drive, serial number 197000.
14″, 16″, 18″ **Monarch Geared Head Lathes.**
#11 **Brown & Sharpe Grinder,** self contained, M.D.
#70A **Heald Internal Grinder,** motor drive, rising blocks.
#33 **Abrasive Surface Grinder,** vertical cup wheel.
Natco Multiple Drills all sizes.
1, 2, 3 and 4 spindle high speed ball bearing **Drill Presses** hand and power feed.
#4 **Consolidated OBI Punch Press,** flywheel type.

We will be pleased to forward full specifications and photographs on any machines we have in stock.

INTERNATIONAL MACHINERY CO.
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- 24", 36", 42" BULLARD NEW ERA VERT. BORING MILLS
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- 10'-16' NILES EXTENSION TYPE VERT. BORING MILL
- 16'-26' NILES EXTENSION EXTRA HEAVY VERT. MILL
- #1, #2, #3 BARRETT HORIZONTAL BORING MILL
- #3-A LANDIS PRECISION BORING MILL (HORIZONTAL)
- 4" BAR DETRICK & HARVEY FLOOR TYPE MILL
- #2, #4, #6 COLBURN HEAVY DUTY DRILLS
- 3' CINCINNATI PLAIN RADIAL
- 4' DRESES PLAIN RADIAL
- 5' AMERICAN TRIPLE PURPOSE PL. RADIAL
- 5' N-B-POND RIGHT LINE PLAIN RADIAL
- 6' AMERICAN UNIVERSAL RADIAL
- #13 BROWN & SHARPE UNIVERSAL GRINDER
- 14"x50" NORTON PLAIN CYLINDRICAL GRINDER
- 30"x144" LANDIS ROLL GRINDER
- 14"-22" PRATT WHITNEY VERTICAL SURFACE GRINDERS
- 100" GOULD & EBERHARDT GEAR HOBBER
- #36-H GOULD & EBERHARDT GEAR HOBBER
- 90" N-B-POND DRIVING WHEEL LATHE
- 109"x50' N-B-POND GEARED HEAD LATHE
- 96"x48½' N-B-POND GEARED HEAD LATHE
- 55"x94' STAMETTS GEARED HEAD BORING LATHE—NEW
- 48"x20' N-B-POND GEARED HEAD LATHE
- 42"x20' N-B-POND GEARED HEAD LATHE
- #2, #3-B MILWAUKEE PLAIN & UNIVERSAL MILLERS
- 92"x87"x42' N-B-POND MOTOR DRIVEN PLANER
- #2-A, #3-A WARNER SWASEY UNIV. TURRET LATHE
- 40' WICKES BENDING ROLLS MOTOR DRIVEN

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Turbo-Generators

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2—Allis-Chalmers 2500 KW, 3/60/6600-v. 200#-500°TT, Condensing—New

2—Westing., 3000 KW, 3/60/2300-v. 200#-500°TT, Condensing

1—General Electric, 1250 KW, 3/60/600-v. 250 # - 55°TT, Non-Condensing

1—General Electric, 1250 KW, 200#-500° TT, 3/60/2300 - v. Condensing

1—General Electric, 1250 KW, 3/60/480-v. Aut. Extraction, 200#-500°, 15-20 lbs. Extr.

1—Allis-Chalmers, 1250 KW, 3/60/480 - v. 200 # - 450° F.TT, Condensing

1—Allis-Chalmers 750 KW, 3/60/480 - v. 200#-450°TT, Condensing: Surface Condenser

1—General Electric, 1000 KW, 3/60/2300-v. 175#, 10# Back Pressure, Non-cond.

1—Allis-Chalmers 750 KW, 3/60/2300 - v. 250#-550°TT, Condensing: Surface Condenser

1—General Electric, NEW, 750 KW, 3/60/2300-v. 250 #, 600°F.T.T., Mixed Pressure Condensing

A Partial List Only of Our Stock

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A SHORT-CUT TO PROFITS

3 Phase 60 Cycle Engine Generator Units

750 KVA Gen. Elec. 2300 v, 150 RPM dir. con. Skinner Unaflow engine.
312 KVA Gen. Elec. 2300/240 v, 200 RPM dir. con. Skinner Unaflow engine.
125 KVA Gen. Elec. 2300 v, 257 RPM dir. con. Skinner counterflow engine.
120 KVA Gen. Elec. 220 or 440 v, 257 RPM dir. con. Ames Unaflow engine.
85 KVA Electric Machinery 2400/240 v, 277 RPM dir. con. Ames Unaflow engine.
60 KVA West. 440 v, 300 RPM dir. con. Ames automatic engine.

250 Volt Direct Current Engine Generator Units

400 KW Elliott 150 RPM generator dir. con. Elliott 4 valve non-condensing engine.
300 KW Crocker Wheeler 150 RPM generator dir. con. Harrisburg automatic engine.
150 KW General Electric 200 RPM generator dir. con. Russell 4-valve engine.
100 KW General Electric 250 RPM generator dir. con. Skinner Unaflow engine.

Motor Generator Sets

300 KW Westinghouse 250 volts direct current generator dir. con. 450 HP, 3 ph, 60 cy, 4000/2300 v, 900 RPM synchronous motor.
200 KW Gen. Elec. 125 v, direct current generator dir. con. 300 HP, 3 ph, 60 cy, 2300 v, 514 RPM squirrel cage motor.
100 KW West. 250 v, direct current generator dir. con. 150 HP, 3 ph, 60 cy, 4000/2300 v, 1200 RPM synch. motor.
55 KW Westinghouse 250 v direct current generator dir. con. 75 HP, 3 ph, 60 cy, 2200 v, 1200 RPM squirrel cage motor.

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300 KW to 2000 KW—25 or 60 cycles—Interpole Modern Units

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1—75 KW Eng. Gen. Set—D.C. Gen. No. 655309, Type MPC—Form LDS 300 Amps Speed 275, volts 240, Gen. Elec. with Ridgeway engines—13x14 single valve side crank.

MOTOR GENERATOR SETS
1—150 KW syn. M. G. set, 2800 v. 60 cyc. 3 ph. 900 RPM, 31.8 amp per ph. West. No. 1827386, D. C.—No. 180 Type SK—100 KW 275 v.—365 amps 900 RPM Weight 8500 lbs. Ser. No. 1827418 KT—110B—three bearing unit with panels.

1—200 KW West. dir. con. gen. set, Ser. No. 4186799, type SK, frame 182,600 V. 333 amp. 1170 RPM comp. wd. interpole.

1—West. induct. motor dir. con., 300 HP 2300 V. 60 cy., 3 ph., 66 amps per term., 1170 RPM rotor cir. 586 V. serial No. 4186795.

1—300 KW G.E. M. G. set No. 349357, Type MPC, Intple., Form H, Amp. 522, sp. 720, v. no load 525, full load 575. Sync. Motor No. 413975, PF-1, type ATI, Class 10-345, 720 Form C H.P. 435, speed 720, volts 6600, amp. 30, cy. 60, with exc.

1—400 KW G.E. M. G. set, Type MPC, Form H, Amps. 728, Speed 720, volts 560 full load, Ser. No. 646182, syn. motors No. 78004, Type ATI 10—580 KVA 720 speed, Form CPF, 8 volts 2200.

1—500 KW G.E. M. G. set—Type MPC, Form H, 600 volts, 833 amps, 720 RPM Ser. No. 324747, d.c. to Motor Type ATI, Form C—720 HP 2300 V. 175 amp. 60 cyc. Ser. No. 413803. Exciter—Type MP—6 - 7 720 Form A 7 KW 720 RPM Ser. No. 343258.

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2—4300 Sq. Ft. Wheeler Sur. Cond.—Ser. Nos. 6010 - 1 1220 1" B & W 18 gauge tubes—13'6" condenses 45,000 lbs. of steam to a 26" vacuum with 2250 GPM of 70 deg. water, with Air Pump—Wheeler C. & E. Co. 04022-3. 8x20x12 Sidepumps—04024-5 5¼x6.

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All sizes, oil and air cooled.

RAILS AND CREOSOTED TIES
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OSGOOD Electric Caterpiller Crane with 50 H.P. A.C. Motor
AMERICAN Saddle Tank Locomotive, 40 ton

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Unusual Opportunity to Modernize with Rebuilt Modern ELECTRICAL EQUIPMENT

SQ. CAGE MOTORS

220/440 volts, 3 Ph., 60 Cycle

Qu.	Hp.	Make	Type	Speed
4	½	G.E.	RKT 445	1200
1	¼	WEM		1725
23	½	WEM	CSA	1140
4	½	Fidelity		1200
		G.E.	RKT 1459	3450
5	¾	WEM	CSA	1140
1	1	Lincoln	b.b.	1800
7	1	G.E.		900
17	1½	G.E.	KT	1200
3	1½	G.E.	KTR	900
15	2	G.E.	KT	1800
			KT	1200
4	2	Cleveland	b.b.	900
19	3	G.E.	KT	1200
5	3	American	b.b.	1160
6	5	American	b.b.	1200
4	5	Howell	KT	1800
7	5	G.E.	CS	1800
5	7½	G.E.	KT	900
15	7½	G.E. fan old.	KT. b.b.	1800
9	7½	Wagner		1140
10	7½	WE&M	CS	1140
2	7½	Triumph		1200
9	10	G.E.	KT	900
15	10	WeM	CS	1160
1	10	Wagner	b.b.	1200
2	15	Reliance		1750
3	20	G.E.	KT	1200
1	25	G.E.	KT	3600
4	25	WEM	CS	685
1	25	Wagner	b.b.	1750

Also large quantity of 30, 40, 50, 60, 75, 100 and 150 Sq. Cage Motors in stock.

SLIP RING MOTORS

220/440 Volts, 60 Cycle, 3 Phase, A.C. Motors, slip ring

Qu.	Hp.	Make	Type	Speed
1	200	Whse.	CW	500
1	200	Allis		580
1	300	G.E.	MT	450
1	150	G.E.	ITC	680
1	100	Whse. 3 bg.	CW	580
1	75	G.E.	1-M	600
1	100	G.E.	1-M	600
2	50	G.E.	MT	600
1	40	Allis		450
1	75	WEM	CW	490
1	75	WEM	CI	575
1	40	G.E.	MTC	900
2	25	G.E.	MT	900
1	20	G.E.	MT	600
1	20/40	G.E.	MT	600/1200
1	25	G.E.	1-M	900
5	20	G.E.	MTC	900
1	7½	G.E.	HI-M	900
1	25	G.E.	MTC	670
2	30	WEM	CW	900
2	10	G.E.	MT	900

D. C. MOTORS

230 Volts Constant Speed

Our vast stock of D.C. motors from 10 H.P. to 100 H.P., all speeds, are worth your investigation.

TRANSFORMERS

Qu.	Kva.	Make	Volts
3	75	G.E.	11000/2300/4000
3	50	WEM	4000/230/460
3	50	G.E.	2300/115/230
3	50	G.E.	2300/230/460
3	37½	Pittsburgh	2300/230/460
3	25	G.E.	2300/230/460
3	25	G.E.	2300/115/230
2	50	Packard	2300/230/460
2	75	WEM	2300/230/460
3	15	Pittsburgh	2300/115/230
1	25	WEM	440/110/220
3	5	G.E.	440/110/220
2	7½	WEM	440/110/220
2	25	Packard	440/110/220
2	50	G.E.	13200/6600 230/460
1	10	Wagner	440/110/220
1	7½	Pitts.	4800/2400 120/240
2	5	WEM	2300/115/230
1	1½	WEM	440/110/220

Also 100, 125, 500, 833 and 1500 K.V.A. Transformers in stock.

CRANE AND HOIST

230 Volts, D.C.

	Hp.	Speed
3-CO-1803	5	1200
2-CO-1807	15	870
3-K-5	20	975
2-K-5	25	850
2-CO-1811	60	600
1-HK	25	550
2-No. 57 Locomotive Motors		
4-No. 23 Locomotive Motors		
1-K-4	12	580
3-CO-1829	25	675
1-CO-2504	10	800
2-K-5	25	550
3-CO-1808	35	675
1-CO-1828	65	

COMPRESSORS

1—Chicago Pneumatic 9x8 Short Belt Drive, complete with A.C. or D.C. Motor.
1—Chicago Pneumatic 9x11 Gear Driven with 250 volts D.C. Motor
1—Chicago Pneumatic 14x12 Short Bel A.C. or D.C. Motor.
1—14x12x9x12 Ingersoll Rand Short Belt with A.C. or D.C. Motor.
Other sizes available.

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Large Savings Assured in This Department. Stock Includes All Types in Addition to Fuse Blocks and Fuses.

CONTROL

A.C.— D.C. Manual Controllers in Stock.

SPECIAL ITEMS

1—200 H.P. Link Belt Silent Chain Drive, 21 tooth pinion, 170 tooth split gear. 38 ft. 14 in. face. 1½ pitch chain.
1—Rolled steel casing for same.
Above never used. Designed to operate 580 RPM drive to 72 driver.
1—Westinghouse Class 12-600 Reversing Control Panel with circuit Breaker, ammeter, etc. for control 150 H.P. 2200, 60 cycle 3 Ph. Motor.
1—Ditto for 150 H.P. 440 volts, 60 cycle Motor.
Both unused.

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Will help you in your plans to *Greater Profits*

BOILERS

4—568 HP **B&W Boilers,** 200 lbs. pres. ASME code with oil burners.
2—500 HP **Stirling Boilers,** 225# pres. oil burners.
4—684 HP **Edge Moor Boilers,** 200# pressure.
2—500 HP **B&W** 200 lb. pres. Boilers with stokers.
7—375 HP **Stirling Boilers.**
2—350 HP **Stirling Boilers,** 200# pres. oil burners.
7—600 HP **B&W** straight tube **Boiler,** 200# pres.
1—300 HP **Stirling Boiler,** 160# pres., new 1928, complete with stoker.
6—750 HP **Stirling Boilers,** 180# pressure, stokers.
3—750 HP **Stirling Boilers,** 200# pres. with stokers.
1—460 HP **Wickes** 3 drum vertical **Boiler,** 160 lbs. pres. new boiler.
3—760 HP **B&W** sectional header **Boilers,** 200 lbs. pressure, ASME code, complete.
2—511 HP **Erie Boilers,** Westinghouse stokers, 200 lbs. pressure.
1—250 HP **Kroeschell Boiler,** 160 lbs. pressure, with chain grate stoker.
3—750 HP **Stirling Boilers,** 250 lbs. pressure.
3—2365 HP **B&W Stirling Boilers,** 240 lbs. pressure, with Westinghouse stokers.

ENGINES

1—140 HP **Fairbanks Morse,** Model 32 D 14, 300 RPM, **Oil Engine,** complete.
1—210 HP **Fairbanks Morse,** Model 32, **Oil Engine,** 300 RPM, complete.
2—200 HP **Fairbanks Morse** type Y style V **Oil Engines,** 257 RPM.
1—280 KW, 3-60-480 volt **Ball Non-releasing Corliss Engine,** fully guaranteed, rebuilt.
1—240 KW 300 KVA **Hamilton Corliss Engine,** 3-60-480 volts.

ALSO

2—500 HP **General Electric Slip Ring Motors,** 450 RPM with control.
1—3000 HP **Hoppes** open type **Feedwater Heater.**
5—**Coxe Traveling Chain Grate Stokers,** 10' 6⅝" wide x 11' long, with fans and engines, complete. Used very little.

TURBINES

2—1500 KW **G.E. Condensing Turbines** with surface condensers.
2—500 KW 3 phase, 60 cycle, **Westinghouse Non-condensing Turbines.**
1—2000 KW **Westinghouse Condensing Turbine** complete. Jet condenser.
1—1250 KW **G.E. Extraction Turbine,** complete, surface condenser, all auxiliaries.
1—750 KW **Allis-Chalmers** 3-60-2300 volt **Condensing Turbine.**
1—5000 KW **Westinghouse Condens. Turbine,** surface condenser, complete.
1—350 HP **Kerr Non-condensing Turbine,** 3600 RPM.
2—937½ KVA **Westinghouse** Condensing **Turbines,** 3-60-480 volts, with jet condensers, complete.
1—125 KVA **Westinghouse Non-condensing Turbine,** 3600 RPM, 3-60-480 volts, with panel.
1—2000 KW **General Electric Turbine,** 3600 RPM, 3-60-2300 volts, with surface condenser.
1—1000 KW **General Electric Condensing Turbine,** 3-60-2300 volts, 3600 RPM, with surface condenser, with auxiliaries.
1—5000 KW **Westinbhouse Turbine,** 3600 RPM, 3 phase, 60 cycle, with jet condenser.
2—1000 KW **General Electric Condensing Turbines,** 3-60-4800 volts, 3600 RPM.

GENERATOR SETS

1—150 KW 3-60-440 V. **Ames Uniflow Engine Set.**
1—290 KW A.C. **Ames Uniflow Eng. Set. (Skinner.)**
1—**Nordberg Uniflow Engine** direct connected to 200 KW 3-60-480 v. generator, complete.
2—125 KVA **Skinner** (counterflow) **Engine Generator Sets.**
2—240 HP **Fairbanks Morse** full diesel oil engines, dir. con. to 170 kva generators; complete plant.
1—50 KW 550 volt, **D.C. Motor Generator Set.**
1—100 HP **Fairbanks Morse** type Y style V **Oil Engine,** direct connected to 66 KW, 250 volt DC generator, with panel board.
1—500 KW 3-60-2300 volt **Skinner Uniflow Engine Generator.**

The above is only a partial list. List your equipment with us.

FLETCHER SALES COMPANY 835 Security Trust Bldg., Indianapolis, Ind.

POWER EQUIPMENT

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3 PHASE 60 CYCLE 240/480/600/2400 VOLTS

1563 KVA Gen. Elect AUTOMATIC EXTRACTION, 150-200 lbs. steam pressure, 0-30 lbs. extraction pressure.
1250 KVA gen. Elect. AUTOMATIC EXTRACTION and AUTOMATIC MIXED PRESSURE, 150-300 lbs. steam pressure 600 deg. TT, 0-20 lbs. low pressure, 0-30 lbs. extraction pressure.
940 KVA West. condensing, 150-200 lbs. steam pressure.
625 KVA West. condensing, 150-200 lbs. steam pressure 525 deg. TT.
375 KVA West. noncondensing, 100-200 lbs. steam pressure 0-15 lbs. back pressure.

● ENGINE GENERATOR SET

3 PHASE 60 CYCLE

438 KVA Gen. Elect. Murray uniflow 135-175 lbs. steam pressure, 0-15 lbs. back pressure; 240-480-600-2400 volts.

● DIESEL GENERATOR UNIT

3 PHASE 60 CYCLE

300 KVA Fairbanks-Morse Full Diesel style VA 240-480-600-2400 volts.

● MOTOR GENERATOR SETS

600 KW Allis-Chalmers synch. 250 v. D.C.; 3 ph. 60 cyc. 2300 volts A.C.; 900 RPM.
150 KW Gen. Elect. synch. 250 v., D.C.; 3 ph. 60 cyc. 2300 volts A.C., 900 RPM.
100 KW Westinghouse synch., 250 v. D.C.; 3 ph., 60 cyc. 220-440 volts A.C., 1200 RPM.

● ROTARY CONVERTER

200 KW West. compound wound interpole 250 v. D.C.; 2 or 3 ph. 60 cyc. 1200 RPM., with 440 volt transformers.

This is a partial list. Send us your inquiries!

THE NATIONAL POWER MACHINERY COMPANY

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Drill, Radial 5' Fosdick, M. D.
Grinders, Roll 30"x144" Landis, 20"x96" Farrel, M. D.
Lathe, 16"x10' G.K., Geared Head, M. D.
Miller, #4 Ohio, choice of tables 101" or 83" length.
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Testing Machines Univ. 100,000# M. D.

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Bleeder Units: 1250, 937, 625 KVA
Condensing Units: 18,750, 12,500, 6250, 3125, 2500, 1875, 1250, 937, 625 & 375 KVA
Non-Con. Units: 6250, 1666, 940, 470, 375, 250, 125 & 94 KVA

DIESEL UNITS

Fairbanks Morse: 500, 300, 250, 200, 125 & 30 KVA
500 KVA 3-60-2300 V.—Busch Sulzer
180 KVA G.E.—McIn. & Seymour
100 KVA G.E. 3-60-240 V.—Worthington
250 HP Ingersoll Rand
90 KVA Fairbanks Morse—F.M. style "VA"

DIRECT CURRENT UNITS

KW	Make
250	250/125 V.—Erie Ball 4V.
150(2)	Wghse. 250 V.—Erie Ball 4V.

UNIFLOW UNITS (A.C.)

KVA	Make
750	G.E.—30x34 Ames
750	G.E.—29x36 Skinner
450	G.E.—25x26 Skinner
360	G.E.—25x26 Skinner
312	G.E.—22x25 Chuse
312	G.E.—22x24 Skinner
120	G.E.—16x16 Ames

4 VALVE UNITS (A.C.)

KVA	Make
500	G.E.—22x30 Erie Ball
200	Ridgeway—16x20 Ridgeway
75	G.E.—Harrisburg

BOILERS (A.S.M.E.)

Sizes from 150 to 600 HP.

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Machine Tools — Boilers
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Lathes, Shapers, Automatics, Drills, Planers, Milling Machinery, Boring Mills, Grinders, etc.
Large buyers of surplus machine tools and sellers of guaranteed rebuilt metal working machinery—Reliable, dependable.

SUN MACHINERY COMPANY
36 Van Vechten St., Newark, N. J.

FOR SALE

1. **Boiler Feed Pump**—220 Lbs. 520° F.
2. **Turbine Driven Centrifugal Pump** 7000 G.P.M. 190 Ft. Head
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Of Factory Management and Maintenance, published monthly at Albany, N. Y., for October 1, 1938.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared D. C. McGraw, who, having been duly sworn according to law, deposes and says that he is the Secretary of the McGraw-Hill Publishing Company, Inc., publishers of Factory Management and Maintenance, and that the following is to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

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D. C. McGRAW, Secretary.

McGRAW-HILL PUBLISHING COMPANY, INC.

Sworn to and subscribed before me this 26th day of September, 1938.

[SEAL] H. E. BEIRNE,

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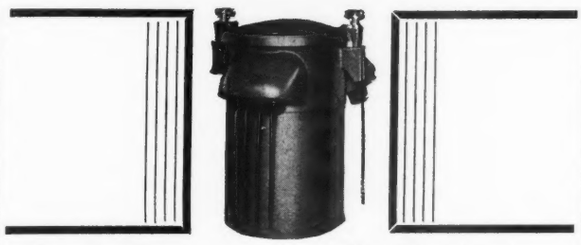

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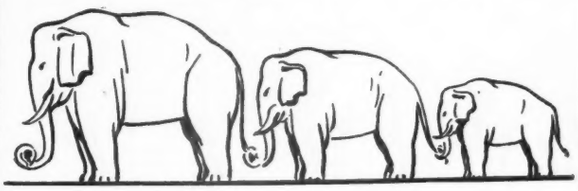

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INDEX TO ADVERTISEMENTS

Page

Acme Steel Company....131, 150
Alan Wood Steel Co.... 215
Alemite Div. Stewart-Warner Corp.... 143
Allen, Oliver Field.... 228
Allen-Bradley Co....insert, 39, 40
Allis-Chalmers Mfg. Co....49, insert, 179, 180
Alvey-Ferguson Mfg. Co.... 132
American Blower Corp.... 199
American Brass Co.... 129
American Hot Dip Galvenizers Assn.... 194
American Optical Co.... 163
American Pulley Co.... 168
American Rolling Mill Co.... 181
American Screw Co.... 15
Associated Engineers, Inc.... 228
Automatic Transportation Co.... 147

Baker-Raulang Co.... 130
Benjamin Electric Co.... 142
Bijur Lubricating Corp.... 128
Black & Decker Mfg. Co.... 37
Blaw-Knox Co.... 198
Boston Woven Hose & Rubber Co..insert, 19 to 22
Bradley Washfountain Co.... 144
Bristol Company....42, 43
Browning Crane & Shovel Co.... 144
Brown Instrument Co....32, 33
Buffalo Forge Co.... 219
Bull Dog Electric Prod. Co.... 29
Bunting Brass & Bronze Co.... 34
Bussmann Mfg. Co....26, 27

Camden Copper Works, Inc.... 229
Carnegie-Illinois Steel Co.... 218
Cash Co., A. W.... 214
Century Electric Co.... 210
Chisholm-Moore Hoist Corp.... 127
Clarage Fan Co.... 216
Clemson Bros.... 148
Colson Corp.... 204
Continental Screw Co.... 15
Corbin Screw Corp.... 15
Cramer & Co., Inc., R. W.... 229
Crane Co.... 197

Darnell Corp., Ltd.... 212
Dayton Safety Ladder Co.... 152
Delta Mfg. Co.... 186
Deming Co.... 226
De Vilbiss Co.... 178
Disston & Sons, Inc., Henry.... 207
Dodge Mfg. Corp.... 6
Ducommun, M.... 229
Du Pont de Nemours & Co., E. I.
190, 191, 192, 193

Eagle-Picher Lead Co.... 222
Electric Controller & Mfg. Co.... 126
Electric Storage Battery Co.... 125
Elliott Service Co.... 35
Elwell-Parker Electric Co.... 18
Exposition of Power & Mechanical Engineering, 13th National.... 176

Fairbanks, Morse & Co.... 200
Faultless Caster Corp.... 188
Fedders Mfg. Co.... 204
Federal Electric Co.... 229
Felters Co.... 225
Finnell System, Inc.... 43
Flexible Metal Hose & Tubing Institute.... 183,
Foxboro Co.... 221

Gardner-Denver Co.... 206
General Electric Co....16, 17, 141
G. E. Co. (Incandescent Lamp Div.).... 209
G. E. Vapor Lamp Co....44, 45
Goodrich Company, B. F....3, 240
Goodrich Electric Co.... 174
Goulds Pumps, Inc.... 193
Graton & Knight Co.... 195

Page

Graybar Electric Company....7, 192
Grinnell Co.... 151
Gulf Oil Corp.... 25

Harnischfeger Corp.... 140
Houghton & Co., E. F.... 184
Hyatt Roller Bearing Co.... 5

Independent Pneu. Tool Co.... 203
Industrial Brownhoist Corp.... 230
Industrial Controller Div. of Square D..3rd Cover
Inland Steel Co.... 56
International Harvester Co.... 175
I-T-E Circuit Breaker Co.... 171

Johns-Manville, Inc.... 217
Johnson Gas Appliance Co.... 148
Jones & Laughlin Steel Corp.... 211

Kerlow Steel Flooring Co.... 229
Keystone Lubricating Co.... 190
Kidde & Co., Walter.... 164
Kinnear Mfg. Co.... 216
Kisco Boiler & Engrg. Co.... 229

Lamson Co.... 223
Leeds & Northrup Co.... 28
Lewis Co., G. B.... 229
Lincoln Engineering Co.... 10
Link-Belt Co.... 4
Logan Co., Inc.... 11
Lucas & Son, Inc., J. L.... 229
Lux Fire Extinguisher.... 164
Lyon Metal Products, Inc.... 169

Macwhyte Co.... 202
Magnus Chemical Co.... 182
Massachusetts Development & Industrial Commission.... 8
Master Electric Co.... 153
McCaskey Register Co.... 165
McGraw-Hill Book Co....208, 226
Mechanical Handling Systems, Inc.... 136
Medart Co.... 216
Milcor Steel Co.... 170
Mercury Mfg. Co.... 212
Methods Engrg. Council, Inc.... 228
Mevlan, A. R. & J. E.... 229
Minnesota Mining & Mfg. Co....172
Mogensen, Allan H.... 228
Mosso Laboratories, C. A.... 190

Nat'l Screw & Mfg. Co.... 15
New Departure Mfg. Co.... 239
Norton Co.... 36

Osborn Mfg. Co.... 9

Page Fence Ass'n.... 154
Pangborn Corp.... 191
Parker-Kalon Corp.... 15
Philadelphia Gear Works.... 196
Pittsburgh Plate Glass Co., Block Div.... 213
Pittsburgh Plate Glass Co., Brush Div.... 200
Powell Smoke Combustion & Furnace Indicator Co., A. E.... 228
Pure Oil Co.... 228

Rhoads & Sons, J. E.... 205
RLM Standards Institute.... 23
Rockbestos Products Corp.... 139
Ronald Press Co.... 212
Ross Engrg. Corp., J. O.... 192
Russell, Burdsall & Ward Bolt & Nut Co.... 15
Ryerson & Son, Inc., Jos. T.... 134

Sarco Co....insert, 137, 138
Scott Paper Co.... 50
Scully Steel Products Co.... 201
Searchlight Section....231 to 237
Service Recorder Co.... 166
Service Section....228, 229

Page

Shafer Bearing Corporation.... 145
Shell Union Corp.... 133
Shepard Niles Crane & Hoist Corp.... 220
Sherwin-Williams Co.... 135
SKF Industries, Inc.... 14
Skilsaw, Inc.... 173
Snead & Co.... 146
Sonneborn Sons, Inc., L.... 24
Spencer Turbine Co.... 182
Square D Company....3rd Cover
Standard Conveyor Co.... 187
Standard Oil Co. of Indiana....2nd Cover
Standard Pressed Steel Co.... 166
Stephens-Adamson Mfg. Co.... 167
Sturtevant Co., B. F.... 177

Taylor Instrument Co.'s....46, 47
Texas Company....12, 13
Thermoid Rubber Div. Thermoid Co.... 227
Thompson & Son Co., H. G.... 41
Tide Water Associated Oil Co....30, 31
Timken Roller Bearing Co....4th Cover
Trico Fuse Mfg. Co.... 152

U. S. Steel Subsidiaries....201, 218

Veeder-Root, Inc.... 189

Waldron Corp., John.... 204
Warren Webster & Co....148, 150, 152
Westinghouse Elec. & Mfg. Co.
149, insert, 155 to 162
Westinghouse (Lighting Div.)....insert, 160
Weston Electrical Instrument Corp.... 224
Wheeling Corrugating Co.... 38
Wiley & Sons, John.... 220
Wing Mfg. Co., L. J.... 185

Yale & Towne Mfg. Co.... 208

Zapon Div. Atlas Powder Co.... 229

▼

INDUSTRIAL CONSULTANTS 228

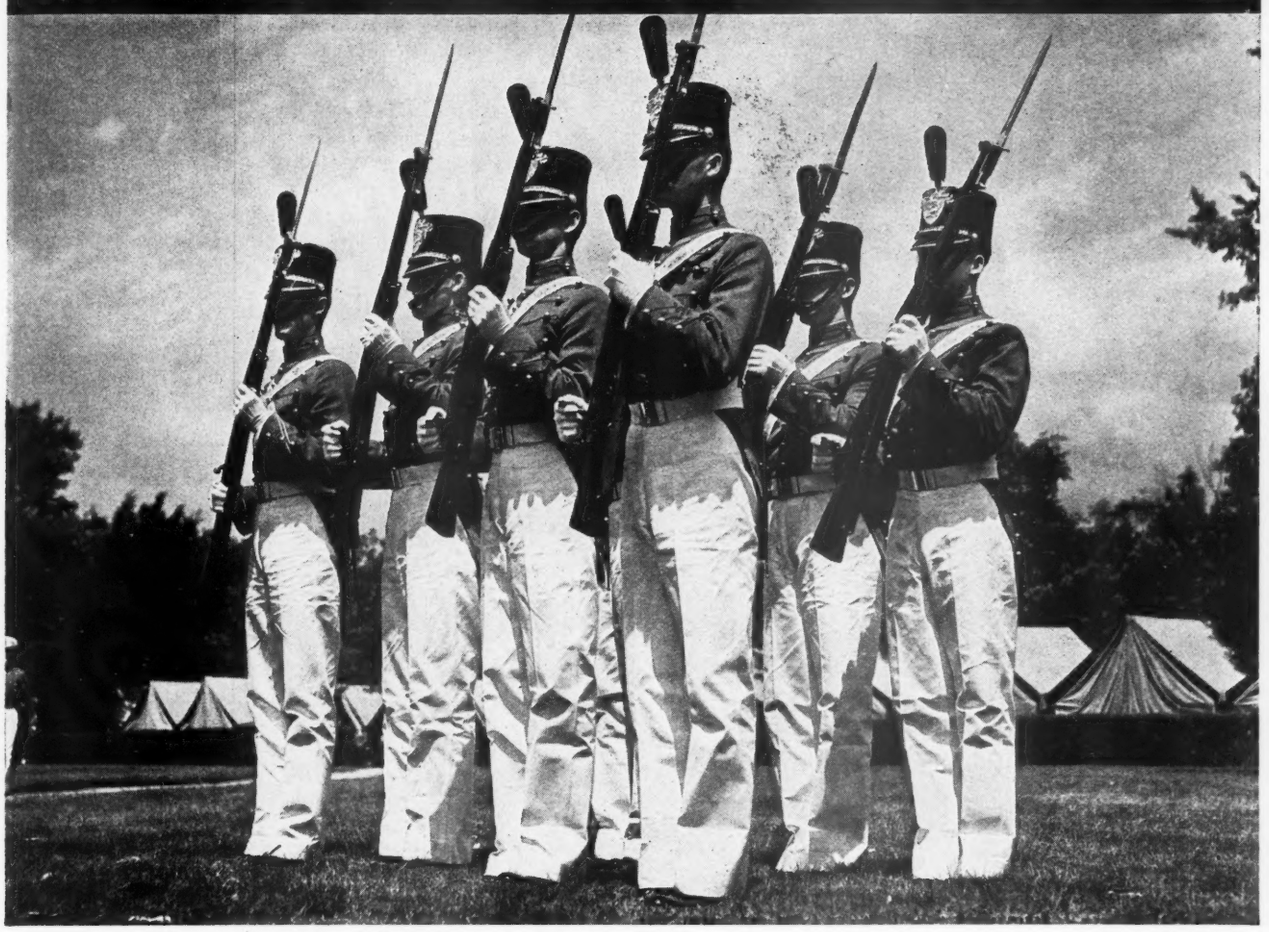
▼

SEARCHLIGHT SECTION

Classified Advertising

Business Opportunities 235
Employment Service 235
Factory For Sale 232
Positions Vacant 236
Positions Wanted 236
Selling Opportunities 236
Equipment New and Used....232-237
Armitage & Gilbert.... 237
Brew Woltman & Co., Inc.... 237
Cincinnati Machinery & Supply Co.... 232
Delta Equipment Co.... 235
Electric Service Co., Inc. 237
Fletcher Sales Co. 235
Hudson Pipe & Supply Co.... 237
Industrial Plants Corp.. 237
International Machinery Co.... 232
Land, L. J. 234
Leese, M. 236
Marr-Galbraith Machy. Co.... 235
Mississippi Valley Equipment Co.... 237
National Power Machy. Co.... 235
Nussbaum & Co. 237
Penn Electrical Engr. Co.... 235
Philadelphia Transformer Co., Inc.... 237
Pierce-Arrow Motor Corp.... 232
Power Plant Equipment Co., Inc.... 236
Rental Service Co., Inc.... 237
Salzberg Co., Inc., H. E. 234
Simmons Machine Tool Corp. 233
Sun Machinery Co. 236
Utilities Electrical Machy. Corp.... 234
Wilms & Co., Walter H.... 234
Woolhiser, H. L. 236

ONE WILL REACH THE HIGHEST RANK



EWING GALLOWAY

. . . for one has all the qualities of a leader

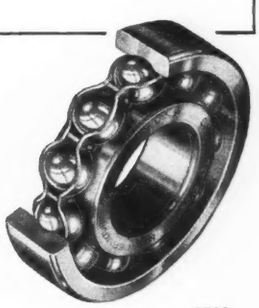
Ball bearings, too, look very much alike. Yet actually they differ in respects that affect their future performance and that of the machines they will serve.

New Departures have *all* of the important attributes that make them leaders . . . superior design, forged alloy steels for great endurance—precision dimension—and equally important: *creative engineering* to apply the bearings effectively and economically.

It pays to design New Departure Ball Bearings into your machines.

Please do not forget that, whatever your bearing problems, New Departure engineers are always ready to help you save and improve.

New Departure, Division General Motors Corporation, Bristol, Conn., or Detroit, Chicago, San Francisco, Los Angeles, Boston, Pittsburgh.

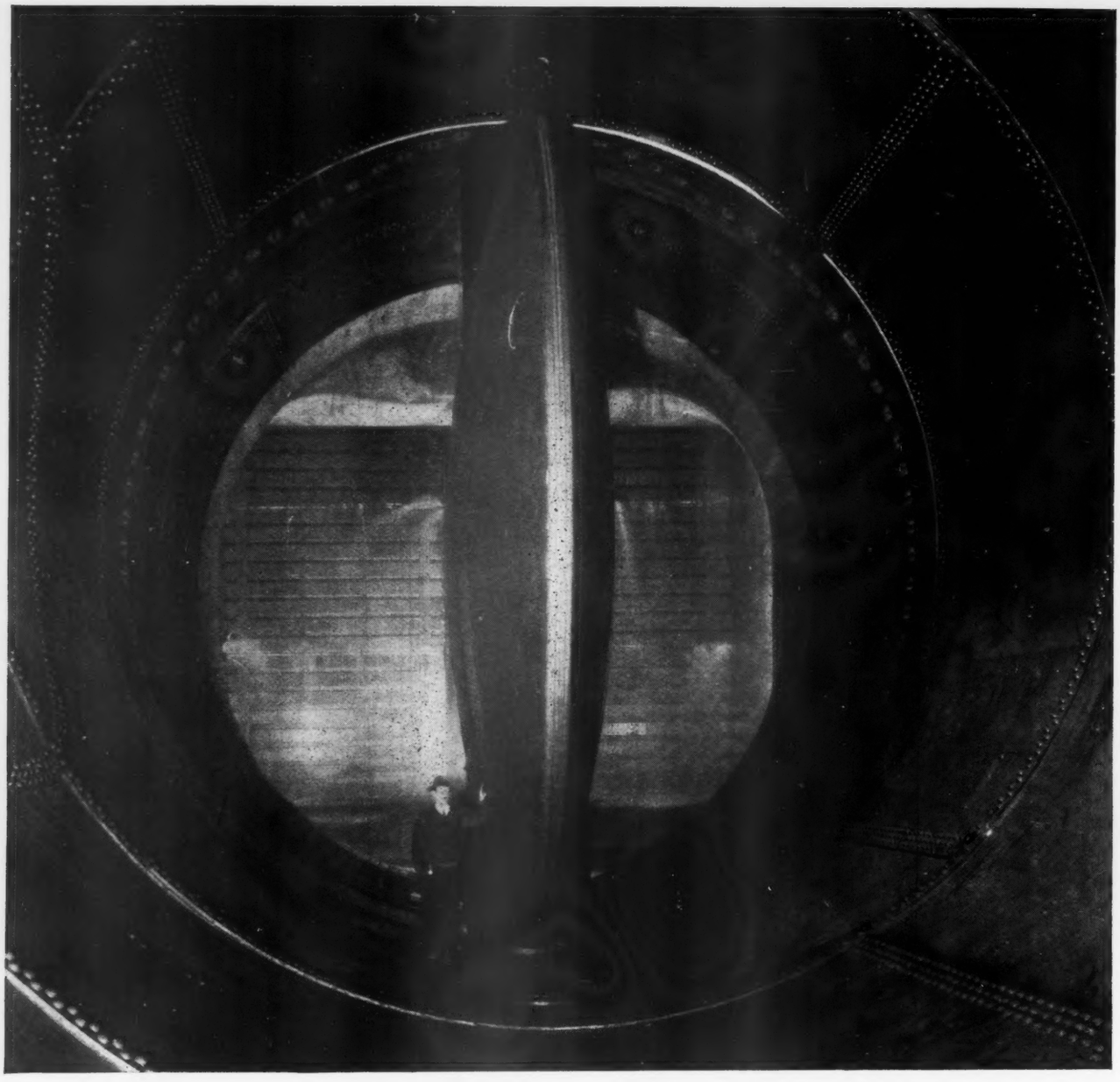


2716

Nothing Rolls Like a Ball

NEW DEPARTURE

WORLD'S NO.1 BALL BEARING



It Keeps A Lake From Leaking

A typical example of Goodrich development in rubber

THREE million pounds of water hammer at this 27-foot valve of steel. Open, it lets water rush past to drive the turbines of the vast Conowingo power dam. Closed, it must hold this mighty force in check so that workmen can safely get into the turbines for repairs.

No metal-to-metal seal could hold this rushing mass of water. Turbine engineers came to Goodrich for a rubber seal that could stand the tearing, pounding force of the water, have long and trouble-free life, keep its flexibility indefinitely. Goodrich developed a tubular gasket—after the huge valve has been closed, this gasket is inflated like a tire (but by water pressure) . . . The engineers had allowed a tolerance of 4 gallons of leakage per hour. When the Goodrich seal was installed, and given its test, actual leakage in an hour was less than one cupful.

Right in your own plant Goodrich engineers can help you make records equally spectacular. Whatever your business, there are rubber products developed by Goodrich research which can improve your product or process, or set new lows in production costs. Transmission belts with 5 times the former flexing life, conveyor belts which carry twice as many tons, hose to meet dozens of special needs, pipe and gaskets which prevent leaks for years—these are typical products of the Goodrich research which your distributor can put to work for your immediate profit. The B. F. Goodrich Company, Mechanical Rubber Goods Division, Akron, Ohio.

Goodrich

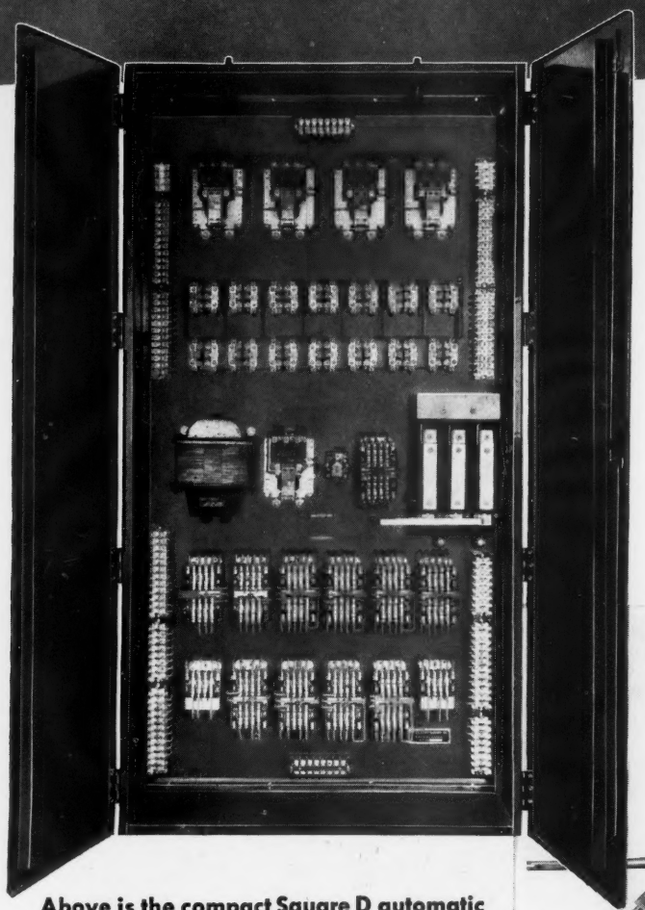
ALL *products problems* IN RUBBER

Another story of Goodrich development work appears on page three

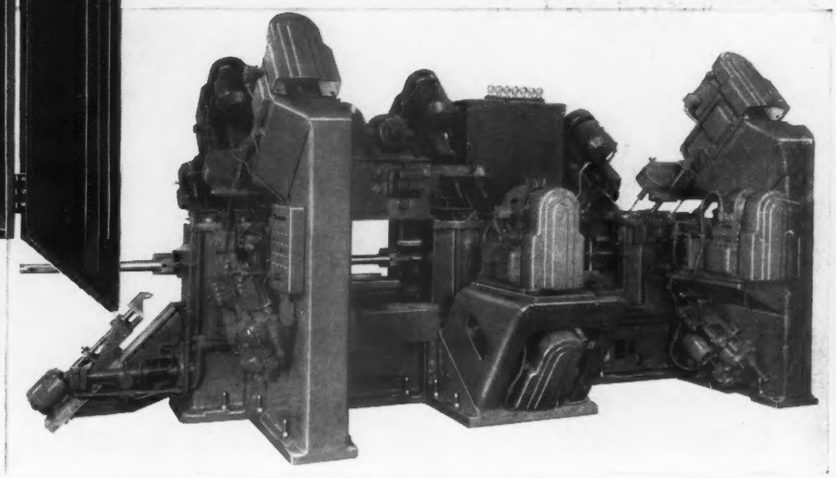
DRILLING CYLINDER BLOCKS 40 BLOCKS PER HOUR

with

AUTOMATIC MOTOR CONTROL



Above is the compact Square D automatic motor control used in the W. F. and John Barnes 21 Spindle Process Through Type Drilling Machine shown at right.



There seems to be no limit to production speeds attained with the new special purpose machine tools and automatic motor control. Here, for example, is a machine that drills 21 miscellaneous holes in 6-cylinder automotive truck blocks at the rate of 40 blocks per hour.

The clamping of the block and indexing through the machine is fully automatic, hydraulically actuated and electrically controlled.

There are seven steps in the operating cycle, each controlled by a Square D mechanically-held relay. All relays are so interlocked in sequence that all functions of one step must be completed before the next step can operate. All motors are controlled by Square D magnetic contactors with thermal overload protection.

A feature of the control is indicating lights to show the progress of the work through the steps of the operating cycle.

Provision is made for manual operation of the machine for tool set-up or inspection. However, all electrical interlocks are retained, thus making it impossible for an operator to perform any function other than the correct one for any given position of the tools.

Wherever automatic motor control is involved, Square D equipment and engineering service can be used to advantage.

CALL IN A

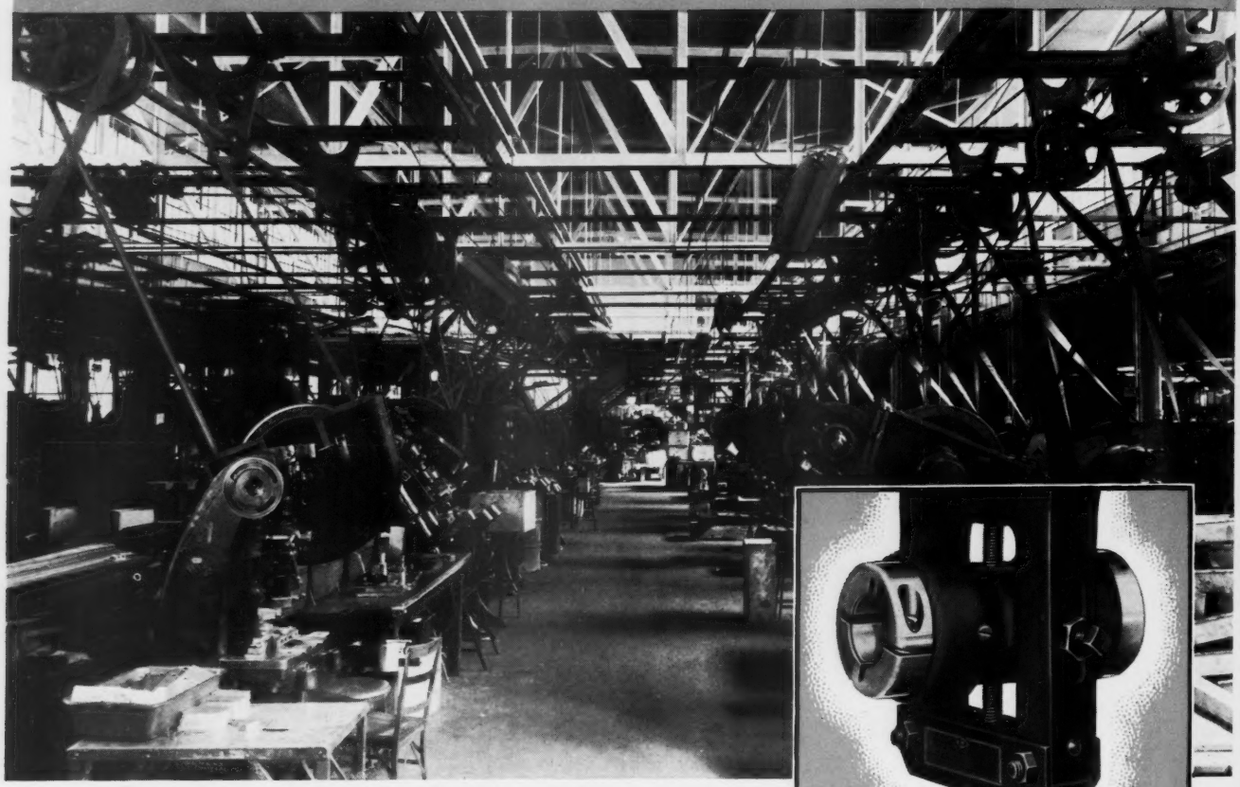
SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

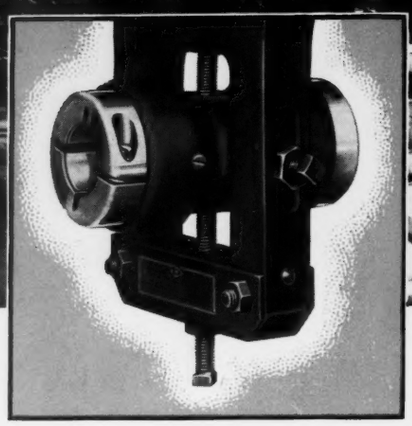
IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

SQUARE D MAN

DODGE-TIMKEN BEARINGS ELIMINATE LINE SHAFT LOSSES



View in plant of the Jefferson Electric Company of Chicago. The modern group drive installation is completely DODGE-TIMKEN Bearing Equipped.



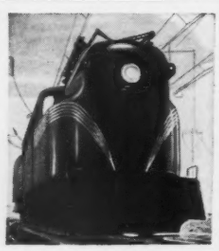
DODGE Line Shaft Hanger equipped with TIMKEN Bearings.

DODGE-TIMKEN Line Shaft Hangers and Pillow Blocks are free from friction and high lubrication costs. Furthermore, they reduce belt wear by preventing belt drag, shaft misalignment and shaft whip. The ability of TIMKEN Bearings to hold shafts in constant alignment and carry all types of loads (including radial, thrust and any combination of the two) keeps belts running smoothly—helps prevent belt jumping thereby minimizing production time losses.

Where there is danger of product spoilage due to oil contamination DODGE-TIMKEN Bearings are the answer for lubrication requirements are not only reduced but "lubrication drip" is prevented.

Timken Bearing Equipped pillow blocks are heavy contributors to plant efficiency. It will pay you to specify—insist on "Timken Bearing Equipped".

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO



The Pennsylvania's new Broadway Limited rolls on TIMKEN Bearings.
GLIDE—as you ride a Timken Bearing Equipped train

Manufacturers of TIMKEN Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; TIMKEN Alloy Steels and Carbon and Alloy Seamless Tubing; TIMKEN Rock Bits; and TIMKEN Fuel Injection Equipment.

TIMKEN
TAPERED ROLLER BEARINGS